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OF
THE AMERICAS

BY

LEONARD BROOKS, M.A. (Cantab. and Lond.)

FORMERLY SECOND MASTER AND GEOGRAPHY MASTER AT THE
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EDITOR'S INTRODUCTION

THE time has gone by when it was thought possible that a textbook of geography should be equally suitable for pupils at different stages of advancement, so that a series of books suited to different stages is necessary for use in schools. Regions may be studied in different orders suited to different circumstances and aims, and, to be entirely satisfying, each scheme of study should have a special series of books. The series, of which this book forms one, is designed to fit a particular scheme—i.e. that in a secondary school in the years at the end of which is one of the First Public Examinations of the type of the London General School Examination, a scheme which has for many years been found in practice to be extremely satisfactory at the William Ellis School.

Three of the volumes cover the world regionally in three years; the fourth contains much of the preceding matter in a condensed form, together with a few additions on subjects which are more profitably studied after other work has been done. Account is taken of the fact that the pupils are advancing in ability, so that, while there is a certain uniformity in that each book provides a north and south section of the world, yet the arrangement is such that the matter increases in difficulty. The series supplies textbooks for a complete school course in geography which includes physical as well as regional geography, and the order in which regions are taken depends to some extent on the desirability of studying particular sections of physical geography in a suitable order.

The Americas seem marked out for early treatment; in these continents illustrations of the simpler ideas in physical geography, dealing, for example, with land forms and denudation, are perhaps more easily come by than elsewhere; physical geography has more obvious relationships to the geography of man, and the influence on man of geographical conditions is fairly simple and direct.

JAMES FAIRGRIEVE.

AUTHOR'S PREFACE

THIS book is the first of a series of four which are intended to cover the geography course for the four years leading up to and including the year in which an examination of matriculation or school certificate standard is taken. Where the main school course occupies five years the first year's work may well cover the ground taken in either Book II or Book III of the Junior Regional Geographies. The present book deals with The Americas, and the treatment is regional. There should be no sharp distinction between what is known as "Physical" and "General" Geography. The chief facts of physical geography should be introduced into the school course just where they come quite naturally. In this book emphasis has been laid upon that part of physical geography which deals with structure, the Ice Age, river work, etc., but this has not been done to the neglect of the historical, human and economic aspects. Many opportunities are given to encourage map drawing and the graphical representation of climatic data, trade returns, the construction of population maps, etc. These exercises are especially suitable at this stage of geography teaching.

In the second book, Asia and Australasia will be taken, and especial emphasis will be laid upon climatology; whilst in the third, when Africa and Europe will be dealt with, the bias will be more definitely an economic one. Thus the groundwork of General and Physical Geography will have been covered, and the pupils prepared for a regional study of the whole world in the fourth book. At the end of each chapter will be found a number of questions and exercises. They are designed to test the pupil's powers of assimilation and originality; and of course it is not intended that answers should be *written* to all, nor are they by any means the only suitable exercise that may be set.

Teachers will find Book I, the *New Regional Map Books*,

by V. C. Spary, B.Sc., published by the University of London Press, Ltd. (price 1s.), of considerable value for use with this book.

Acknowledgments are due to the Royal Mail Steam Packet Co. for permission to use the photograph of St. Lucia; to the Canadian Government for Figs. 23, 31 to 34; to the Provincial Government of British Columbia for Fig. 37; and to the Moravian Mission Society for Figs. 24 and 25. It is hoped that teachers, with the help of their pupils, will obtain additional illustrations, maps, diagrams, etc. These are best kept in portfolios. It is surprising what a lot of teaching material can be gathered together even over a short period of two or three years.

As the author is a Divisional Inspector of Schools in the service of the London County Council, the rules of that Authority make it necessary for him to state that the Council is in no way responsible for any statements appearing in this book.

L. B.

44 *Wildwood Road*,
Hampstead Garden Suburb, N.W.11.
August 1934.

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A REGIONAL GEOGRAPHY OF THE AMERICAS

CHAPTER I

THE DISCOVERY OF NORTH AMERICA

The Norse Discovery.—The discovery of North America is generally accredited to Christopher Columbus, but we now know that hundreds of years earlier, the continent was reached by Norsemen. Fig. 1 shows the stepping-stones by which Norse explorations expanded. They are the Shetlands, the Faröes, Iceland and Greenland. Near the end of the tenth century, Eric the Red, outlawed from Norway on account of his misdeeds, sought refuge in Iceland, which was then well known. His lawlessness brought about his exile from that island, and he sailed westwards to the land he named Greenland, as a contrast to Iceland, and in order to tempt men to go there. Greenland had been reached about a hundred years before, but no attempt at settlement had been made. When the period of his exile was completed, Eric returned to Iceland in order to obtain colonists for Greenland. In this task he was successful, and founded a colony which lasted for four hundred years.

In the year 1000 A.D., Leif Ericson, son of Eric the Red, landed on the mainland, and gave the names Helluland, or slab land, on account of the great extent of rough flat rock; Markland, or tree land, and Vinland, or vine land. These places were probably Newfoundland, Nova Scotia and some part of the New England States respectively. Attempts at colonization were not successful, and after the failure of the colony of Greenland, settlement in America came to an end.

The Voyages of Christopher Columbus.—It was from the voyages of Christopher Columbus and his contemporaries that the existence of an American continent was made known to the world, for at the time of these voyages people were quite ignorant of the discoveries of the Norsemen. Fig. 2 shows the world as it was known to Europeans before the

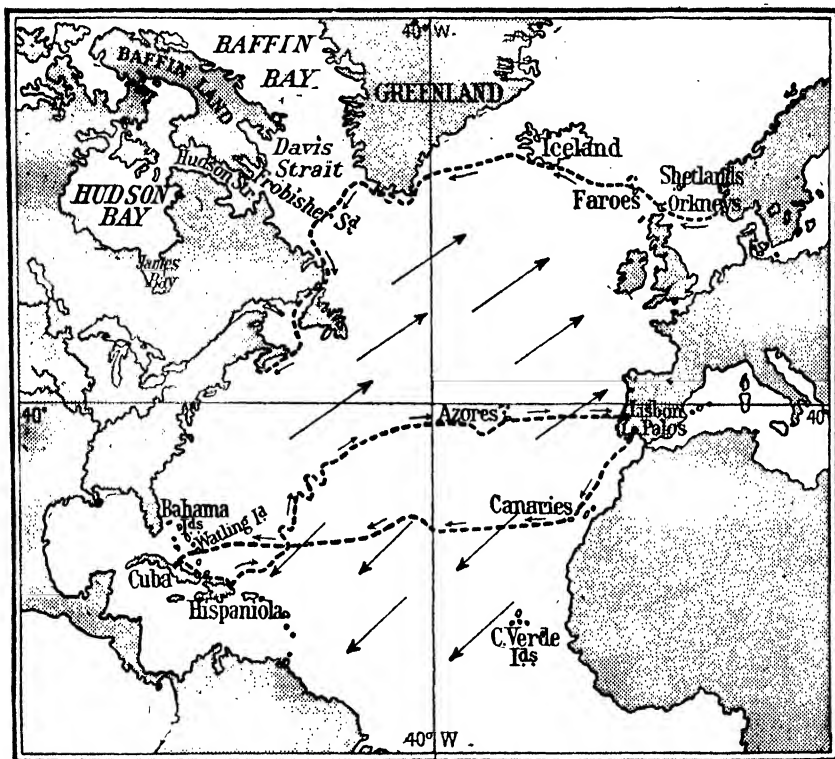


FIG. 1.—The stepping-stones by which the Norsemen reached America and the route taken by Columbus on his great voyage.

journey of Columbus. It will be seen that nothing was known of America or Australia as well as of very large tracts of Asia and Africa.

Columbus was born at Genoa about the year 1447, and first went to sea when a boy of fourteen. When twenty-seven years of age he went to Portugal and worked as a sailor, taking part in journeys southwards as far as the Guinea coast and northwards as far as Iceland. At this time there lived

in Florence a doctor and astronomer named Paul Toscanelli, who wrote a pamphlet, illustrated by a map, describing a new method of reaching the riches of the east by sailing to the west. In doing this he was reviving the work of the Greek geographer, Ptolemy, whom he followed in under-estimating the size of the earth, for he said that the distance between Western Europe and Eastern Asia was about 5,000 miles. Toscanelli also suggested that there were stepping-stones on the way from the West Coast of Africa to the Indies. They were the Canaries, Antilia and Cipangu (Fig. 3). The last

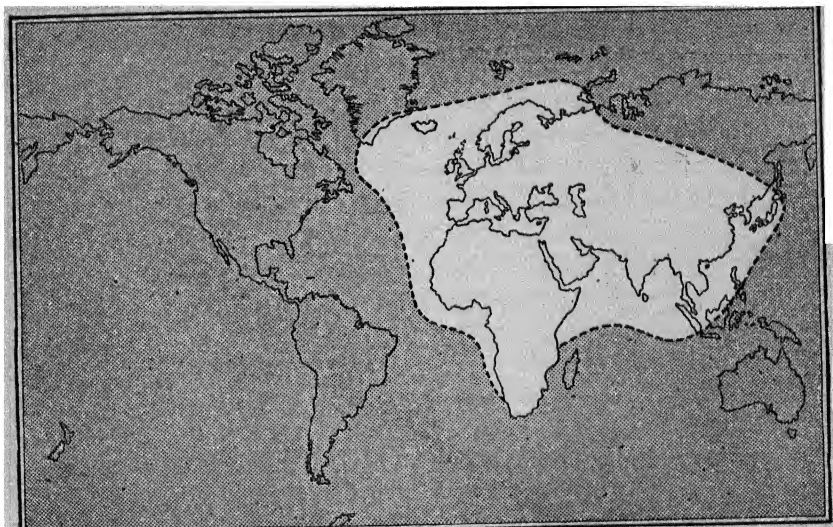


FIG. 2.—The unshaded area shows how much of the world was known when Columbus made his great voyage in 1492.

named was Japan, whilst Antilia was a fabled island of seven cities, in which two archbishops and five bishops had settled during the eighth century. The word is now preserved in the names Greater and Lesser Antilles, into which the West Indies are classified. Columbus saw one of Toscanelli's pamphlets, and adopted all his ideas, and it was this which filled him with the burning desire to attempt the voyage. Although no copy of Toscanelli's map now exists, it can be reconstructed from the first globe which was made in 1492 by Behaim, one of the contemporaries of Columbus. He, too, adopted Toscanelli's scheme; and his globe, which is still

preserved in Nuremberg, shows no continent between the west coast of North America and the east coast of Asia, but clearly marks the stepping-stones referred to.

The Portuguese were too busy with their own schemes of reaching the Indies by rounding the south of Africa, and Columbus was refused help. This he sought in Spain, where he was called before a council of scholars at Salamanca. Columbus, of course, believed that the world was a sphere, and that the east could be reached by sailing westwards. This was not accepted by his questioners, who showed the

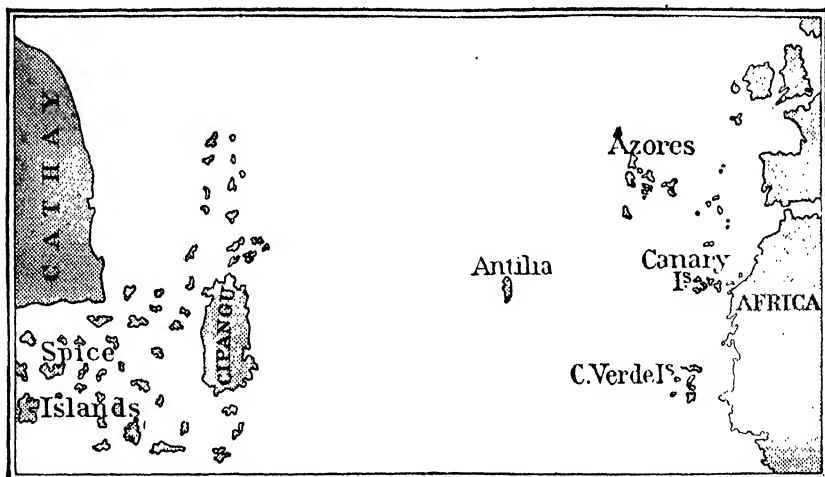


FIG. 3.—The stepping-stones to the Indies.

lack of geographical knowledge in those days by asking such questions as, "Do you mean to tell us that there are people who live on the opposite side of the earth, and that they walk with their feet opposite to ours, and their heads hanging downwards; that there is a part of the world where it rains, hails and snows upwards?" They also declared that even if men did get to the other side of the world they would be unable to return, for the rotundity of the earth would present a huge mountain up which no boat could sail.

However, after many disappointments, Columbus was at last given the help without which he could not have made his voyage, for he was a poor man, and on Friday, August 3, 1492, set sail from Palos in charge of three small ships, the *Santa Maria*, the *Pinta* and the *Nina*. The total crew num-

bered eighty-eight, and these were obtained with the greatest difficulty, the pressgang having to be resorted to. It is interesting to notice that among the crew were one Englishman and one Irishman. First the Canaries were made for, and a stay of one month was made here. On September 9 the Canaries were left behind, and Columbus steered his ship due west to find out the mystery of the great unknown (see Fig. 1). The reason for this course was the map of Toscanelli. On October 12, after many evidences of its presence, land was sighted. It was soon realized that only a very small island had been reached. To this island Columbus gave the name San Salvador, but it is now known as Watling Island. Sailing westwards, Cuba was reached, and later the large island of Haiti, which was named Hispaniola. Off this island the *Santa Maria* was wrecked, and since the *Pinta* had deserted off Cuba, the *Nina* prepared to make the return journey alone, but was rejoined by the *Pinta* soon after leaving. Columbus had, however, formed a settlement, which he named La Navidad, and left in charge forty-five men who were to get together as much gold, spices, etc. as possible. On the outward journey, the steady N.E. trade winds had been of great help, and owing to the more northerly course taken on the return journey, a quick passage was made, thanks to the westerly winds (see Fig. 1). On arriving in Spain Columbus was received with great honour, his progress to the court of Ferdinand and Isabella at Barcelona being one long triumph.

In the autumn of 1493 Columbus made preparations for another journey, and this time had no difficulty in obtaining a fleet of seventeen ships and the necessary crews. There were more than one thousand men, whilst the number of stowaways is said to have been about a hundred. Practically the same course as before was taken, but this time the island of Dominica was touched first. Many of the neighbouring islands were discovered and named; but Columbus was most anxious to reach Hispaniola to see how the men left behind at La Navidad had been faring. To his dismay he found the settlement in ruins, and learned of the fate of the men themselves. Some had died of sickness, the rest had quarrelled and split up into small parties which raided the natives until the latter had turned upon them and killed the remain-

der. A new settlement was made, but it was soon apparent that these islands did not produce the great wealth of gold, silver, precious stones and spices which it was expected would be found. Neither were there great cities to sack. Discontent broke out, and many men drifted home. It is not necessary to go into the unhappy quarrels and disagreements between Columbus and the leaders, suffice it to say that in 1496 he had to return to Spain in order to give at court an account of his governorship. On this return voyage the course was set against the trade winds and a long and arduous journey was the result.

Columbus made two more voyages, the third in 1498, and the fourth and last in 1502. On the former he discovered the island of Trinidad and saw the low coast of the Orinoco, which he believed to be another island. He revisited Hispaniola, and found that conditions had reached a state of grave disorder. He was not able to set matters straight, and complaints having reached Spain, a commission was sent out to make inquiries. Columbus was arrested, and sent back to Spain in chains. Upon his arrival he was freed, but was never restored to favour, and did not forget the great injustice.

On his fourth and last voyage westwards he was forbidden to land in Hispaniola. He reached the mainland of Central America and sailed along the coast of Honduras, but still found no sign of the great cities of Cathay, although he still believed very firmly that he had reached the Indies, and died, not fully understanding that he had really reached a continent, of whose existence he had not dreamed. But he had proved to sailors that there was no danger in boldly striking out into the ocean. It had taken the Portuguese from 1418 to 1486 to reach the Cape of Good Hope, for they adopted the slow method of clinging to the coast. Following the example of Columbus, Vasco da Gama in 1497 made the journey from Portugal to the Cape. Columbus died in 1506 at Valladolid.

Once Columbus had led the way to the west it was not very difficult for others to follow. In 1497 John Cabot, a Venetian resident in Bristol, obtained permission from Henry VII to make an expedition towards the west. Taking a more northerly course than Columbus, he reached the coast-line of North America, probably at Cape Breton Island,

whilst he also saw the large island of Newfoundland. On his return the thrifty king rewarded Cabot by a grant of £10. In 1498 a second voyage was made, but John Cabot died during the outward journey. Command was taken by his son Sebastian, who succeeded in exploring a considerable extent of Canadian coast-line.

The voyages of Amerigo Vespucci, of whom we shall learn later, demonstrated that the Indies were still further eastwards, and that a new land had been reached. The Portuguese, after the successful journey of Vasco da Gama, succeeded in their quest for a method of reaching the Indies by sailing round the south of Africa, and the Spaniards were shown the way westwards by Magellan, who rounded Cape Horn and crossed the Pacific twenty-two years later. After some time attempts were made to find a north-west route to the far east, and if you examine your map of North America you will find the names of the famous sailors who sought this passage perpetuated in the names given to most of the bays, islands, etc. They were Davis, Baffin, Hudson, Frobisher, Franklin and others. It was not until 1903-6 that Captain Amundsen navigated a boat round the north of Canada. The commercial value of this passage is nil.

Now let us return to the Spanish discoveries in the West Indies. By the year 1518, that is, twenty-six years after the first landing of Columbus, the whole of the West Indies had been discovered, coasting voyages had been made along the east coast of Central America, and some settlements had been made. Balboa had crossed the narrow isthmus of Panama and had seen the Pacific Ocean. To the governor of Cuba, Velasquez, were brought stories of natives quite unlike the semi-savages of the West Indies. These were reported to live among the high mountains in lands to the north and south of the isthmus from which Balboa had seen the great ocean beyond, and these countries were stated to be exceedingly rich in gold. Hernando Cortes was instructed to investigate these stories in the lands to the north, and he sailed from Cuba in November 1518. After calling at several places along the coast, he selected a suitable point from which to begin his expedition into the interior. The collection of huts which he built was named Vera Cruz, and on its site is the modern port of the same name. You

should read elsewhere the full story of the conquest of Mexico, for it is one of absorbing interest. After two years, full of fighting and exciting incidents, Cortes became master of Mexico, having conquered the Aztecs and captured their capital, Mexico City. The astonishment of the Indians when they first saw the strange dress, armour, cannon, and horses of the invaders, was equalled by that of the Spaniards when they found a very large population, well-built cities, elaborate temples, and rich fields of maize. Mexico was soon seen to be enormously rich in gold and silver, which found their way to Spain in great quantities. Very soon the whole of Mexico and Central America had been discovered.

From Mexico the Spaniards later spread northwards, and occupied the land which now forms the south-western states of the United States. Ferdinand de Soto tried to find another El Dorado in the countries to the north of the Gulf of Mexico, and landed in Florida in 1539. From there he travelled westwards until the Mississippi was reached, afterwards following that river as far as its junction with the Missouri. Excursions were also made in the vast plains to the west of the Mississippi, but no "lands of gold" were found. Instead, his followers suffered untold hardships and privations, and often were attacked by Indians. De Soto died of fever, and after four years of wanderings the survivors returned to Cuba. The first exploration of the St. Lawrence valley was accomplished by Frenchmen, Cartier (1535) and Champlain (1608).

It only remains to mention that Sir Francis Drake, the first Englishman to sail round the world (1577-80), was the first European to sail along the coast of north-western United States. He called the country New Albion, and took possession of it in the name of Queen Elizabeth. Juan de Fuca reached Vancouver Island in 1592, and reported that there was a great inland sea, and this fostered the belief in a north-west passage. Note the position of the strait which bears his name. The maps of the period joined north-west America to Asia, but the voyages of Bering in 1741 and Captain Cook in 1774 corrected this.

CHAPTER II

THE PHYSICAL FEATURES OF NORTH AMERICA

I. THE MAKING OF THE CONTINENT

As we look at the map of North America and see to the west a great system of mountain ranges and plateaus, to the east another lower highland mass, and between these vast plains, do we not wonder how these things came into existence? We have learned how America became known to Europeans through the voyages of Columbus, and later we shall learn of the discoveries of Vespucci, Magellan and other great seamen. We know that white men have inhabited this continent since the days of those voyages, and that before them the red man had the land to himself. But the story of the growth of the continent itself goes very much further back. Continents are not made quickly: it takes probably millions and millions of years, just how many we do not know. The history of the making of a continent can be read in its rocks. Men who study the rocks of which our lands are made are called geologists; but although they have been able to tell us much, there is still a great deal that we do not know.

It is believed that at one time the earth was a very hot sphere like the sun, and, like the latter, gave off heat into space. Then the earth cooled very gradually, and after a very long time the crust of solid rock was formed. The interior of the earth is still hot. The temperature is much higher at the bottom of a deep mine than at the surface; and you know that there are springs which give out hot water, geysers which send into the air columns of boiling water, and volcanoes from which pour streams of hot lava. These show us that the interior of the earth is still very hot, although the crust of rock has become quite cold. Indeed, the interior cannot become cool, for all the time it is getting less or contracting, and this process keeps up the heat. You must have

noticed that when an apple is drying the skin forms wrinkles. This simple fact will help you to understand many things. We have said that the interior of the earth is very hot, and is always contracting as it cools. The skin of the apple forms those wrinkles because it does not contract like the centre, but has to accommodate itself to a smaller interior. In just the same way, whilst the interior of the earth was slowly contracting, the outer crust of solid rock had to wrinkle, crack and settle down upon an interior of diminishing size. In the great hollows or basins water collected, and oceans were formed. The tops of the wrinkles and the higher rock areas stood out above the waters and formed mountain chains and land masses. Thus, very simply and briefly, we see how the continents were made, but we must be careful not to think that the parts of the earth which are above the waters to-day have always been so. During the long history of the continents very many changes have taken place, and vast areas which once were continents, are now the beds of the oceans and *vice versa*.

Now let us learn something of the growth of North America. The oldest part of the continent is the Laurentian highland district of Eastern Canada. Although called a highland area, it is not high enough to deserve the name of mountainous. It was once very much higher, however, and during the countless ages it has been much worn down. Round this ancient portion the rest of the continent appears to have grown. Next in age are the Eastern Highlands, or Appalachian system, which were pressed into folds and uplifted. Later came the western range and plateaus. Of course, the uplift of these great mountains would take place very slowly. Lastly, the central plains appeared and the greater part of the present continent stood out from the ocean.

II. SHAPE, SIZE AND POSITION OF NORTH AMERICA

Turn in an atlas to the map of North America. Notice that it is roughly triangular in shape, and that it is broadest in the north. It will be seen that Alaska comes very close to Asia, whilst the north-east corner is a long way from Europe. What ocean washes the continent's western shores? Its eastern and northern shores? Now notice that in the

south of Mexico there is a narrow, low isthmus, called the Isthmus of Tehuantepec. That is the southern boundary of North America which includes Mexico, the United States,

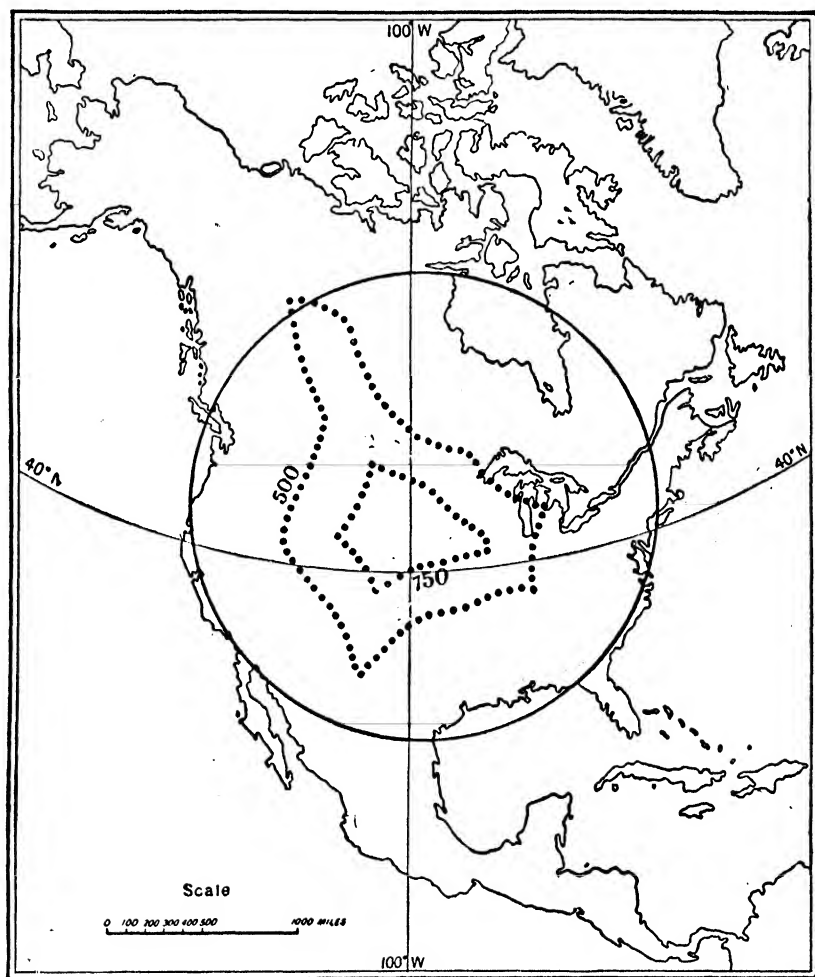


FIG. 4.—The circle has a radius equal to 1,250 miles. Places within the dotted lines are more than 500 and 750 miles, respectively, from the sea.

Canada and Alaska. In area, the continent is about 9,000,000 square miles, which is two and a half times that of Europe.

Observe the position of North America with regard to the

Tropic of Cancer and the Arctic Circle. The whole continent, with the exception of the southern portion of Mexico, lies outside the tropics, whilst the great islands in the Arctic Ocean and the north coast-lands lie within the Arctic Circle. The greater portion of the continent is in temperate latitudes, and these lands have a great stretch in longitude, that is, in an east and west direction. Look at Fig. 4, which shows that North America is a fairly compact land mass. It will be seen that a large part of the continent lies within a circle of 1,250 miles radius, whilst the area which is more than 750 miles from the nearest sea is not very large. It should be noted, however, that 750 miles is a long way from the sea. In Europe it is only in Russia that it is possible to get 500 miles from the sea.

III. THE BUILD OF THE CONTINENT

Let us first take a general look at the physical features of North America. The three great divisions to which reference has already been made are at once noted. They are—

1. The Western Highlands.
2. The lower Eastern Highlands.
3. The plains which occupy the trough between them.

1. *The Western Highlands.*—You will see that these are much higher and broader than the Eastern Highlands. Where are they broadest? *How* broad are they here? An examination of the map will show that the Western Highlands consist of very long, high ranges of mountains which run in a north and south direction, and that between these ranges are high plateaus which are themselves crossed by mountain ranges. What range forms the eastern edge of the system? Trace this range southwards into Mexico, where it is known as the Sierra Madre or Mother Range. Fig. 5 will be of great help in tracing these ranges. What range forms the coastal mountains of Canada? Trace these further south and notice that they are known as the Sierra Nevadas in the United States. You will see that the western Sierra Madre forms the western edge of the Mexican plateau. Look now at the peninsula of Lower California and notice that it consists of a long chain of mountains.

Trace these northwards, and it will be evident that they become the Coast Range of the United States. Where is there a break in this range? Further northwards the Coast Range is represented by the islands off the west coast of

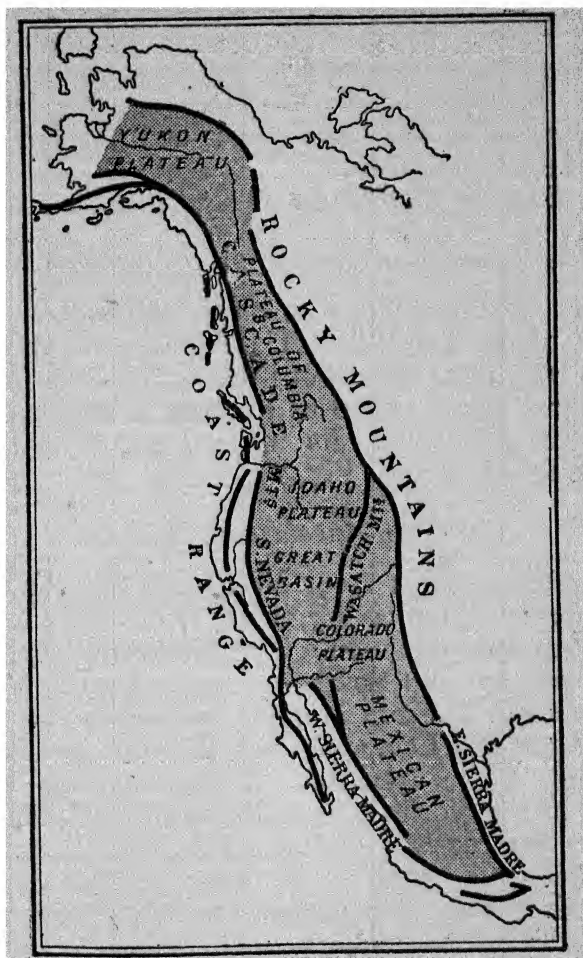


FIG. 5.—Key to the build of Western North America.

Canada. Between this long series of coastal ranges, represented by Lower California, the Coast Range and the islands, which are the higher parts of an old range, and the western edge of the great western mountain system, represented by the Cascades and Sierra Nevadas and the western Sierra

Madre, are portions of the plain which once probably ran the whole distance. The Gulf of California is a sunken portion; behind San Francisco it is evident in the plains of the Sacramento and Joaquin rivers. To the north of this plain notice the great volcanic peak of Mount Shasta which blocks the valley. Further northwards the plain reappears, and in Canada is represented by the drowned land between the islands mentioned and the coast (see Fig. 36). This complete system of mountain ranges and plateaus is known as the Western Cordillera.

2. *The Eastern Highlands.* These include—

(a) *The Laurentian Highlands of Eastern Canada*

We have already referred to these highlands as being the oldest part of the continent. The region is an ancient highland area which has been worn down. It sinks in the west to the central plains and rises to about a mile in height in the Labrador peninsula. Its western end is marked by a chain of great lakes (see Fig. 7).

(b) *The Appalachian System*

This system extends from Newfoundland almost to the Gulf of Mexico, running for about 2,000 miles in a north-east to south-west direction. The Hudson River divides it into the Northern and Southern Appalachians. Which are higher? In the northern section, subsidence has separated Newfoundland and Labrador from the rest, and has caused the lowlands to be drowned. A physical map will show that much of the Northern Appalachians is of relatively low elevation. The coast of Maine is bold and rocky, although it does not reach a height of 600 feet above sea level. South of the Hudson the Appalachians are much higher, and we can easily distinguish—

(1) *The Alleghany Plateau* in the west. This plateau rises gradually from the lowlands of the Mississippi basin, and has a steep eastern slope facing south-east. This steep slope is called an escarpment.

(2) *The Appalachian Valley.* This broad valley is between the Alleghany plateau on the west and

the parallel ridges of the Appalachians on the east.

- (3) *The Appalachians.* These mountains are a series of parallel ranges and valleys, which until the days of railways made east and west travelling very difficult indeed. To the east they sink to the Piedmont plateau, which, as its name implies, is at the foot of the Appalachians. From the Piedmont plateau eastwards and southwards to the coast are—
- (4) *The Coastal Plains.* These Atlantic and Gulf plains are composed of newer rocks, and have been made by uplift which has added to the continent at different times land which was formerly under the sea. The coast-line here is not like that of Maine. Why? Examine Fig. 6, which shows a section across the Eastern Highlands.

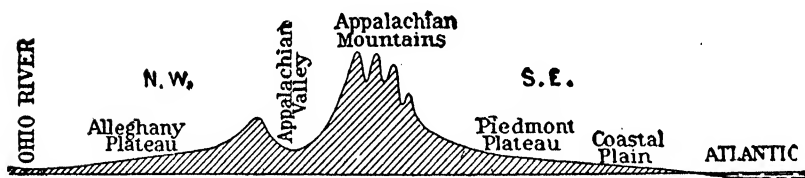


FIG. 6.—A diagrammatic section across the Eastern Highlands.

3. *The Central Plains.* These occupy about one-third of the continent. To the west they rise very gradually to the Rockies. Notice how very low the divide is between the Mississippi and the Red River. You will see that the same is true of the divides between most of the rivers of the plains. The Mackenzie drains the plains northwards, the Nelson, Churchill and St. Lawrence eastwards, and the Mississippi southwards. The map shows a very large number of lakes on the northern plains. This Lake Plain, which surrounds Hudson Bay, is composed of old hard rock which has been glaciated. Hudson Bay itself is very shallow, and has been formed by the sinking of the land.

In this brief sketch of the build of the continent there have been references to sinking and uplifting. Gathering together what has been learned, we see that sinking has taken place on the north-west, the northern and north-east

coasts, whilst coastal plains have been formed by uplift along the coast from the Hudson to Texas. The plateaus of south-western North America have also been considerably uplifted. This points to the fact that the whole of the north of North America, roughly from the Hudson River to the Columbia River, has been sinking, and this has probably caused a corresponding uplift in the south.

EXERCISES

1. Using your physical map of North America, draw three sections across the continent from west to east, and one from north to south. Be careful not to exaggerate the vertical scale too much.

2. Make a map to show the physical features of North America. Select three contours from your atlas, and show the position of the great mountain ranges by printing their names in correct position.

3. What change would there be in the appearance of North America (i) if the continent were uplifted 600 feet; (ii) if the continent were submerged 600 feet?

4. Turn to Fig. 66, which shows the drainage areas of South America. Make a similar map for North America, shaded so as to show the areas drained (i) to the Arctic; (ii) to the Atlantic; (iii) to the Pacific; (iv) to continental basins. What broad comparisons do you notice between this map and Fig. 66?

CHAPTER III

HOW THE MOUNTAINS, PLATEAUS AND PLAINS WERE MADE ¹

WE have been speaking of mountain ranges, plateaus and plains and we shall now learn something of the way in which they were made. It will be recalled that the interior of the earth is gradually cooling and that this causes it to contract, whilst this contraction in turn causes the hard crust of rock to sink, wrinkle, or crumple. Fig. 7 shows the chief structural divisions of North America, and indicates clearly that the Western Highlands consist of plateaus and several types of mountains; the Central Plains of a worn-down highland and a large area of sedimentary rocks; and the Eastern Highlands of mountains which are the remains of a much older mountain system.

MOUNTAINS

We shall first consider what are known as folded mountains.

1. *Folded Mountains*.—Suppose there are some pieces of thick cloth of similar size placed in a pile as in Fig. 8. At one end there is a block of wood which is nailed so as to keep in position. At the other end is another block which is not fixed. If the latter be pushed towards the fixed block, the pieces of cloth will be thrown into a fold or folds which will become more pronounced the more the block of wood is pushed along. In a similar way, if lateral or side pressure is exerted the rocks composing the crust of the earth will be forced to take up less space and crumpling will follow. Very often a number of parallel ranges is the result, as in the Jura Mountains between France and Switzerland, or in the first foldings of the Appalachian Mountains. Of course, the folds are not always as simple as they are in Fig. 8, and sometimes they take the forms shown in Fig. 9. Neither

¹ This chapter may be omitted.

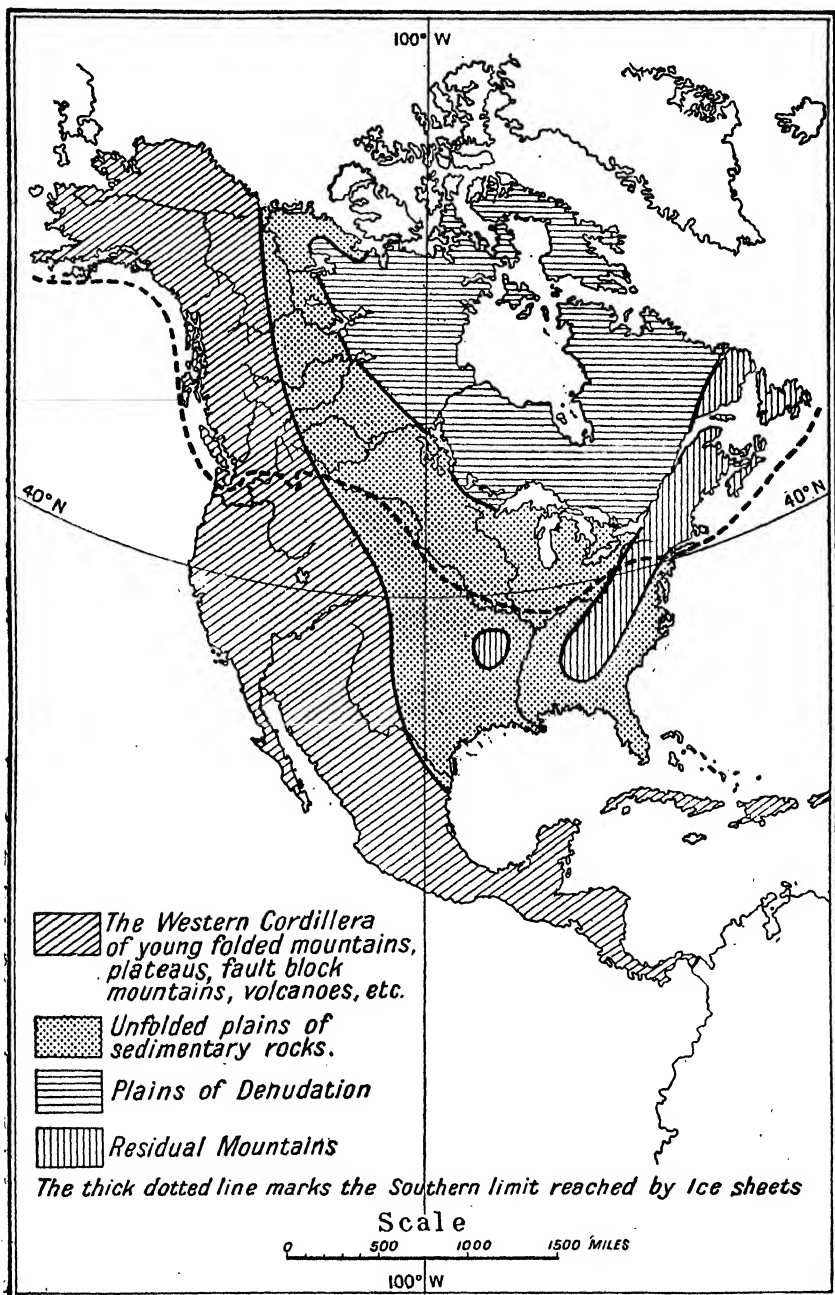


FIG. 7.—The chief structural divisions of North America.

do the rocks always bend without breaking, despite the fact that the pressure may be steadily exerted over a great length of time. Very often breaking or faulting takes place whilst the rocks are assuming folds and a slipping or falling of the strata takes place along the fault (Fig. 10).

Examples of folded ranges in the Americas are found in the Rockies, Cascades, Sierra Nevadas, Coast Range and Andes. We must not forget, however, that as soon as

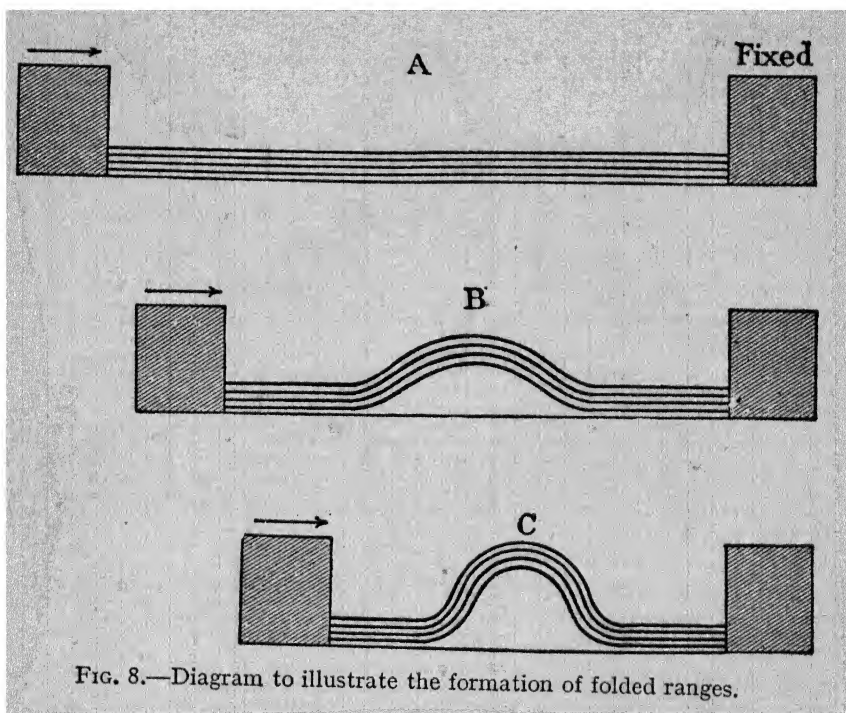


FIG. 8.—Diagram to illustrate the formation of folded ranges.

mountains begin to grow, the forces of nature, such as running water, frost, ice, wind, etc., all set to work to reduce them. This process of wearing down and sculpturing is known as *denudation*. We have just learned that the chief cause of earth folding is the crumpling of the earth's crust, due to the contraction of the interior; but another cause may be mentioned here. We shall learn later of the work carried on by rivers and of the immense loads of rock waste which, in the course of time, they remove from the higher

to the lower parts of their basins. The Mississippi alone carries to its delta 400,000,000 tons of sediment every year. This transference of such enormous weights of material from high lands to plains is in itself probably sufficient to

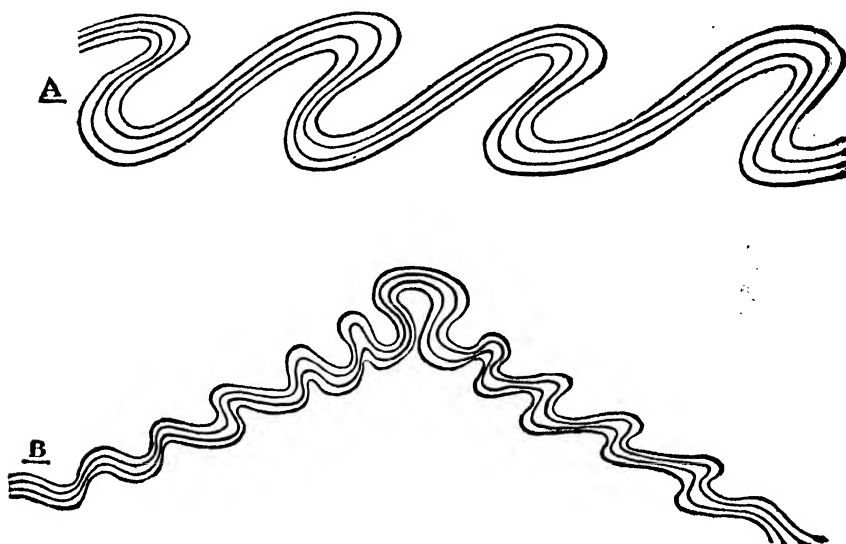


FIG. 9.—These diagrams illustrate more complicated folding. **A** shows a series of overfolds; **B** illustrates what is known as *fan structure*, in which there are many minor folds on the flanks of the main uplift. Of course, denudation makes great changes in the appearance of both **A** and **B**.

provide the lateral force necessary to cause the earth's crust to fold.

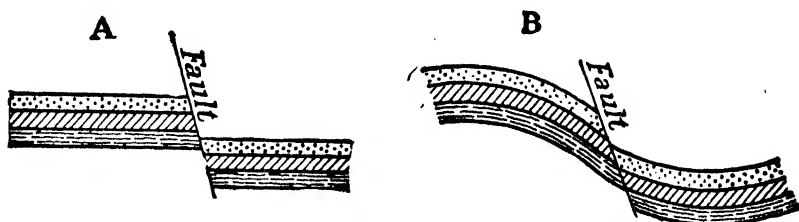


FIG. 10.—Diagrams to illustrate faults in horizontal and folded strata.

Another type of folded mountain is produced as follows: lava is sometimes forced upwards and introduced beneath layers of rocks which are thus compelled to assume a dome-

shaped or mushroom-shaped uplift, the plan of its base being a circle. Fig. 11 illustrates this. An uplift of this kind is known as a *laccolite*.

The best examples of mountain masses of this type are the Henry Mountains of Southern Utah and there are also many examples in the Rockies. Naturally, denudation will considerably modify their original appearance.

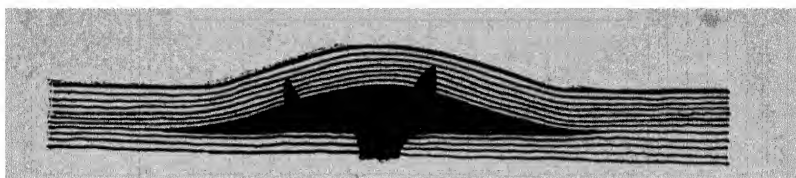


FIG. 11.—Diagram to illustrate the formation of a dome-shaped uplift caused by the intrusion of lava.

2. *Mountains due to Faulting.*—These are sometimes known as fault block mountains and there are many examples of these in the Western Cordilleras of the Americas. Fig. 12 illustrates the formation of the simplest type of

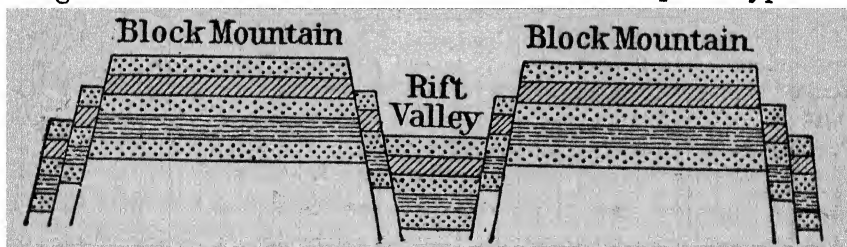


FIG. 12.—This figure illustrates the formation of block mountains.

block mountains. In the Great Basin of the Western Highlands of North America (see Fig. 5) there are many examples of another type of block mountain and Fig. 13 explains how these are formed. Instead of folding, faults occur and the blocks of strata are uplifted and tilted. Such mountains have a short steep slope and a long gradual slope. In a region like the Great Basin where denudation does not take place so rapidly the steep slopes often preserve their cliff-like appearances. Some of these mountains are from 4,000 to 5,000 feet high; they vary in width from 10 to 20 miles, and in length from 50 to 100 miles. Most of them run

north and south, a direction followed by the rivers which generally end in salt lakes. The tilting of these blocks has not yet ceased, for earthquakes are not uncommon. Even a movement of a few inches would be sufficient to cause earth tremors, whilst a sudden movement of about a foot would cause very disastrous earthquakes.

3. *Residual Mountains*.—These are mountains which owe their origin to the fact that some of the land has been worn away and intervening portions have been left standing as high ground. They, too, have been lowered, but not so quickly as their surroundings. The Appalachians may be placed under this heading. Originally they were a series of folded ranges and these were worn down to a plateau. Then this plateau was uplifted from 1,000 to 2,000 feet and denudation was hastened. The rivers have carried away the softer layers of rock, thus etching out the hard rocks as

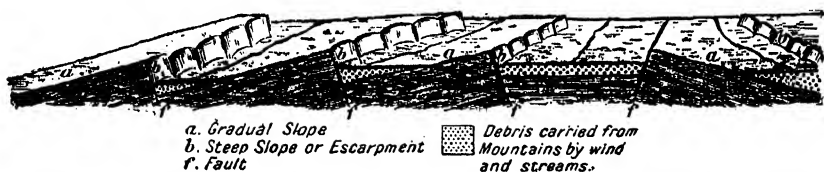


FIG. 13.—This diagram shows strata which have been faulted and tilted.

mountain ridges. It is these latter which at present form the parallel ridges already referred to (see p. 15). In our own country, the Highlands of Scotland are residual mountains, for they have been formed from the denudation of an old plateau.

4. *Volcanoes*, or mountains of accumulation, have been made by the piling up of material on the surface of the earth. Most of the processes of nature go on almost unnoticed and without great violence. In earthquakes, hurricanes, and storms of thunder and lightning we see something of nature's violence, but most of all in the eruption of a great volcano, for not only is the sight itself terrible to behold, but prosperous cities are overwhelmed and often thousands of lives are lost. We have learned that deep in the earth are rocks which are heated to a very high temperature, and to this we can now add that the pressure of the rocks above them is so great that they cannot become liquid until that

pressure is diminished. Fig. 14 shows some of the volcanoes of the Americas. It will be noticed that they are all on the great north-south line of the west coast bordering the Pacific Ocean. The same figure shows that the volcanic belt is continued through the Aleutian Islands and along the

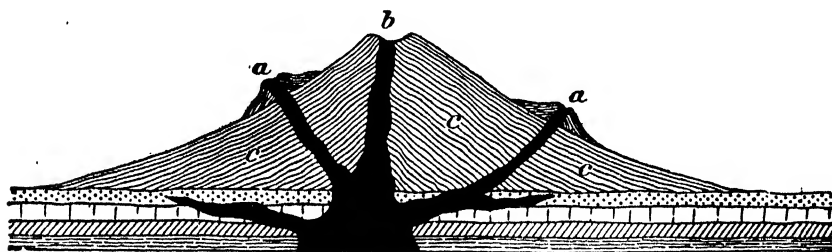


FIG. 14.—The volcanic girdle of the Pacific Ocean. The dots represent volcanoes.

peninsula of Kamchatka, through the eastern festoon islands of Asia to New Zealand. In the Antarctic the belt is represented by Mount Erebus, near to which were the winter quarters of Scott and Shackleton. Thus we have what has been called "The Fiery Ring of the Pacific." These volcanoes are in a belt of young folded mountains. If you look at the map of the Pacific Ocean, you will see that it is a

huge deep basin. It is supposed that the bed of this vast ocean has collapsed and that this was accompanied by a pressure towards the ocean from the surrounding lands and in this way the folded ranges were made. As these mountain masses were being uplifted, extensive faulting must have occurred, finding a way for the lava to force a passage through on its way to the surface. The fact that there are still so many active volcanoes in the Americas goes to prove that the forces which produced these mountain masses are still at work. In recent years both San Francisco and Valparaiso have been visited by disastrous earthquakes.

Steam plays a very important part in assisting volcanoes to eject materials. Water sinks into the ground, where, deep



a. a. Minor Cones. b. Crater. c. c. Sheets of Lava, Ashes, etc.

FIG. 15.—A diagrammatic section of a volcano.

down below the surface, it is heated. When the pressure is diminished, owing to lava being ejected, it turns into steam which has tremendous power, and there is no doubt that it is by means of this that rocks may be raised and fragments hurled out of volcanoes. It probably has much to do in helping streams of molten rock, which have been forced to rise owing to the pressure similar to that which causes the earth's crust to fold in mountain building, to reach the surface.

In some cases the early stages in the growth of a volcano have been observed. First, earthquakes are experienced. These also occur during the upward passage of the lava which breaks through the strata to the surface (see Fig. 15). When the eruption is accompanied by steam and explosions of gas much of the lava is blown into fragments, the smallest of which are the so-called cinders and ashes. The large fragments build a conical heap round the point

where the materials are ejected. The steam and gases keep a passage through this heap, the cup-shaped depression at the top being called the crater. But when not accompanied by violent explosions, the lava flows up the passage which has been made and runs down the sides of the young volcano. In this way a volcano of very great elevation may

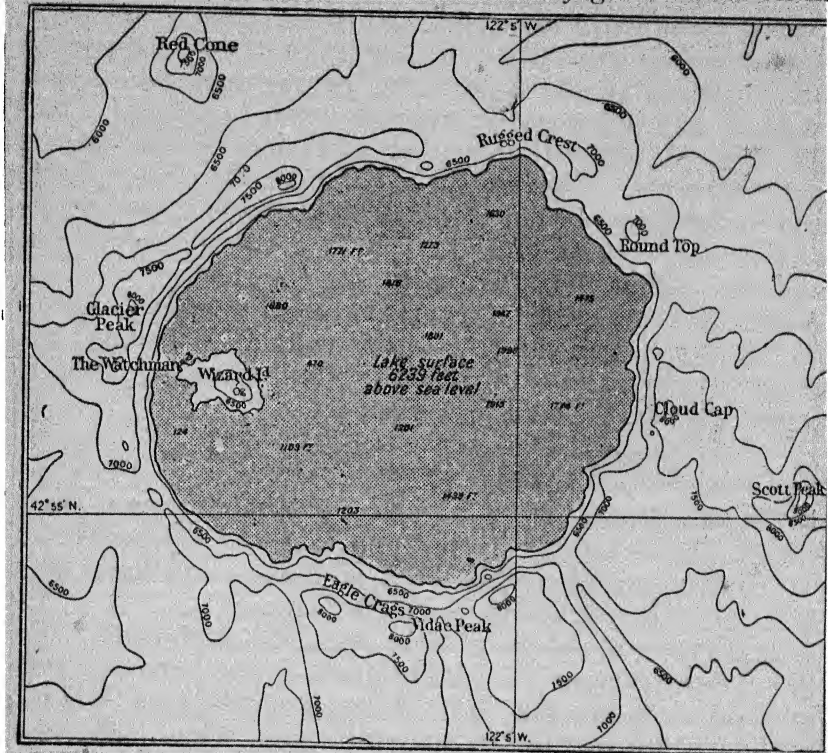


FIG. 16.—Map of Mount Mazama and Crater Lake. Notice the small craters and cones in the neighbourhood. The lake is six miles from east to west through Wizard Is.

be built up. The volcano of Jorullo in Southern Mexico was made in a single night on September 29th, 1759. In June of that year subterranean noises were heard and frequent earthquakes took place. After a period of calm the terrible noises began again on September 28th. The inhabitants fled to the mountains, and in what had been plantations of sugarcane and indigo, a volcano made its appearance during the night. The eruptions continued for about six months, many cones, the highest of which is Jorullo, being formed.

Fig. 15 shows a section of a volcano and illustrates the structure of the cone as being generally of sheets of lava and ashes. Very often there are branch vents and thus we have smaller cones being built on the slopes of the larger one. Mount Etna, in the island of Sicily, has nearly two hundred such secondary ones.

In many volcanoes the upper part of the cone is destroyed either by violent explosions, by underground disturbances, or by the collapse of the cone owing to the removal of lava beneath it. In this way the crater becomes very large. Examine Fig. 16, which is a map of an extinct volcano named Mount Mazama. The crater is occupied by Crater Lake, which is the deepest lake in the United States. Notice the island to the west of the lake. It is a volcano which has grown up within the old crater.

After eruptions the tube becomes filled with a plug of hard lava. Sometimes all the rest of the volcano is denuded excepting this plug, and many of these strange-looking derelicts are met with in the Western States.

PLAINS AND PLATEAUS

1. *Plains*.—In the Americas we have the following types—

(a) Those formed by the uplift of the sea bottom.

(b) Those which have been highlands and have been worn down to a rough plain.

(c) Those which have been made by deposition.

(a) *Those formed by Uplift of the Sea Bottom*.—Examples of these are the Gulf Plains bordering the Atlantic from the mouth of the Hudson to Texas. They have been formed by the uplift of the southern portion of the continent, causing the sea bottom to become dry land. The parts of the sea bottom which have been uplifted were portions of the continental shelf.

Other examples are the great Prairie Plains in the interior of the continent. The rocks under these plains are horizontal, and consist largely of limestone which was deposited on the floor of the ancient sea which for countless ages separated the Eastern and Western Highlands. The Prairie Plains rise imperceptibly towards the Rockies, and become the *High Plains*. These are formed of many layers of clay, sands and gravels which have been washed from the moun-

tains, carried by the rivers to the sea, and there spread over the bottom in layers. Uplift helped to raise these layers above sea level.

(b) *Those which are Denuded Highlands.*—The best example is the Great Lakes Plain of the Hudson Bay area. This is the oldest part of the continent, and the wearing down of countless ages, especially the work of the various ice sheets which have covered the area, has produced a region of hard rock which is a *peneplain*, that is, almost a plain. You would not expect the surface to be as level as that of a plain composed of horizontal rocks. Many parts of the Northern Appalachians are peneplains.

(c) *Plains of Deposition.*—These are usually associated with rivers.

- (1) *The Delta Plains*, such as those at the mouths of the Yukon, Mississippi, Orinoco and Amazon.
- (2) *The Alluvial Plains.*—These have been formed by the filling up of shallow seas by the deposits of the great rivers. Examples are found in much of the Mississippi Plain below Cairo, and in considerable areas of the plains of the Orinoco, La Plata and Amazon in South America.
- (3) Smaller plains are made by the silting up of lakes by the materials brought into them by rivers, for the current receives a check on entering a lake, sediment is deposited, and a delta is made. In time this fills the lake. The valley of the Red River of the North, an important river flowing northwards into Lake Winnipeg, was once an enormous lake much bigger in extent than all the Great Lakes of the St. Lawrence basin put together. The fine deposits which were spread over the floor of this lake, known to geologists as Lake Agassiz, are now the finest wheat lands in the world. There are very many similar lake plains in North-eastern America. The lakes of which they were once the beds were formed by the great barrier of the Ice Sheet (see Chapter IV) which, when receding, acted as a dam across north-flowing streams, and filled their valleys with the water from the melting ice. When the

ice sheets finally receded the lakes were drained. The plateau lakes, Great Salt (Utah) and Titicaca (Bolivia), were formerly far more extensive than to-day, and their former beds are now lake plains. These lakes have diminished in area owing to the drier conditions which now obtain in those regions.

2. *Plateaus*.—The following are the chief types of plateaus—

- (a) Plateaus made of accumulated materials.
- (b) Plateaus which have been made by the elevation of a former plain.
- (c) Highland areas which have been worn down to plateaus.

(a) *Plateaus of Accumulation*.—A good example is the plateau across which the Snake River flows. This is composed of horizontal sheets of lava which have reached the surface and spread out, building up what is known as the Idaho plateau, across which the Snake River has cut very deep gorges. The Snake gorge is 4,000 feet deep, and the river has not reached the bottom of the lava. Look again at Fig. 11. The lava in that case does not reach the surface, but thrusts the strata upwards. But if it pushes right through the strata and reaches the surface it then may spread out in great sheets, gradually building up a plateau. There are similar plateaus in other parts of the Western Cordillera, especially in Mexico.

(b) *Plateaus due to the Elevation of Plains*.

- (1) The High Plains already noted may be included under the heading of plateaus, for they reach an elevation of more than a mile; but the increase in elevation is so gradual that they are spoken of as plains.

(2) *The Plateaus of the Cordilleras of North and South America*.—The growth of the great mountain ranges of these systems was accompanied by the uplift of the adjoining plain, and of the land between the ranges. Thus the High Plains just mentioned were uplifted as the Rockies were formed; similar high plains are found at the eastern base of the Andes. Similarly, the

Alleghany plateau to the west of the Appalachians accompanied the growth of those mountains. The land between the ranges is sometimes raised very high indeed, as between the Rockies and the Sierra Nevadas (7,000 to 8,000 feet) or the Bolivian plateau (over 12,000 feet). As a rule these plateaus are tilted, and are broken by great faults, but not sufficiently to lose their plateau character (see Fig. 13).

(c) *Highland Areas which have been worn down to Plateaus.*—We have examples of these in the Laurentian plateaus of Eastern Canada and the Piedmont plateau east of the Appalachian ridges.

EXERCISES

1. Explain each of the following terms: Cordillera; fault; peneplain; crater; plateau; mesa.
2. Explain, using diagrams, the difference between folded mountains and those which are remnants of plateaus. Give examples of each.
3. Describe very simply how the growth of fold mountains may be illustrated.
4. Where are the largest number of volcanoes in the Americas? Why is this?
5. Make a collection of as many pictures of volcanoes as you can and classify them.
6. Draw a section through Mount Mazama and Crater Lake (Fig. 16). How does its breadth compare with its depth?

CHAPTER IV

THE GREAT ICE AGE

QUITE recently, as a geologist reckons time, but an immense number of years ago as time is ordinarily reckoned, we know that the north of North America was buried beneath a great ice-sheet. We do not know exactly how long ago, but we do know that it was long after the great fold mountains, plateaus, plains, etc., were made. There is evidence that during the Great Ice Age there were several advances and retreats of the ice-sheet, so that over some areas the ice passed several times. Fig. 7 shows the farthest limits south reached by the ice during its several advances, and not the limits reached during any particular advance. These great ice-sheets had so very much to do with the forming of water-falls and lakes, with the grinding of the rocks, and with the sinking of the northern portion of the continent, that it is very important for us to learn something about them. Why they came we do not know, although we can be certain that the climate must have been very much colder than to-day and that they receded as the climate gradually became warmer. Ice-sheets very similar to those which covered the northern parts of North America can be seen to-day in the Danish island of Greenland and in the Antarctic Continent.

Let us briefly examine the Greenland Ice-Cap which covers the whole of the land excepting narrow strips along the coast. It resembles a very gently sloping plateau. The slope is seldom more than 1° , so that the surface has the appearance of a plain. Only towards the coasts do the summits of mountains appear above the surface of the ice. This ice-cap is made of snow which accumulates on the interior in great amounts. The weight of the upper layers of snow presses heavily upon the snow underneath and turns it into ice, just in the same way that you can turn a snowball into ice by pressing it very hard in your hands. The ice moves very slowly outwards, just as a lump of plasticine does if you leave it on a flat surface with a weight on the top of it. From the ends of the glaciers which fill the

valleys and hollows, for the ice-sheet itself does not reach the coast, large blocks of ice break off forming the icebergs which are carried southwards by the Labrador Current, to the great danger of ocean liners. Great as are the Greenland icebergs, they are exceeded in size by those of the Antarctic. As they move southwards, they are getting into warmer latitudes and begin to melt, and it is very seldom that they reach so far south as latitude 40° N. The sea, too, in polar regions freezes, and the great sheets of frozen sea which move southwards in early summer are known as *ice-floes*. Icebergs have their place of origin on land.

Let us now return to the great ice-sheets which have covered the north of North America, and of which the Greenland ice-sheet is a remaining fragment. The latter is known to be of enormous thickness, for the mountains which have been spoken of as having only their summits peeping above the ice are over 5,000 feet in height, and are not very far from the coast. So that if we speak of the American ice-sheets as being over a mile deep in their thickest parts we shall not be exaggerating. As one of these great sheets passed over the land it carried away the soil which had already been made. Pieces of rock under the ice were carried along, and the great weight above them caused them to scratch and scrape the rocks over which they passed, whilst many rock fragments were ground to powder. We can see, therefore, that a great amount of rock waste was carried along underneath the ice-sheet, which all the time was moving southwards. As it stretched southwards it reached warmer latitudes, so that the end was always melting. Whilst melting exceeded the rate of flow the ice-sheet naturally receded. When the melting was just sufficient to keep pace with the movement, the edge of the ice-sheet would be in the same place, and we know that this must have been so for long periods. All the rock waste carried under the ice was eventually dragged along to its edge, and if that were stationary for a long time a line of low hills was formed of the rock load. Some of these reach a height of two hundred feet. Such masses of clay, gravel and rock are called moraines. Morainic hills are known as hummocks, and their irregular distribution shows that the melting edge of the ice-sheet was by no means regular. In

the end the ice-sheet receded, and, as we have said, its remnants still exist in Greenland and many of the islands to the north of Canada. Let us consider briefly what work these great ice-sheets accomplished as they passed over the country, scraping, scratching, digging, carrying, and dumping. We may consider this work under the following headings—

1. *They made Lakes.*—If we look at a large scale map of the New England States, we shall observe a very large number of lakes. An atlas map of the Hudson Bay area will show the same feature. Indeed, this is a common feature of glaciated regions. The lakes have been formed in the following ways—

- (a) The ice-sheets left loads of rock waste and clay, irregularly deposited on the land. These would sometimes be left so as to block a river valley. When the sheet receded, water would fill up the valleys behind the barrier, and lakes would thus be formed. Such lakes cease to exist when the rivers draining them cut through the barrier and drain off their water. We have already learned (see p. 27) that lakes cease to exist when filled by sediment brought into them by rivers. Indeed, lakes are not permanent features of a landscape.
- (b) As the ice-sheets passed over the ground they excavated hollows by their power of digging and scooping into the rock itself. Lakes occupying such hollows are known as rock-bottom lakes.

The Great Lakes drained by the river St. Lawrence were not in existence before the Ice Age. They occupy very broad but shallow valleys which have been deepened by the scooping of the ice-sheets, and blocked by drift thrown across them.

2. *They made Waterfalls.*—Very often the ice-sheets, by putting a barrier of drift across a river valley or by partially filling one, made the stream take a new course when the ice receded. When the new course lay over ledges or steep slopes, waterfalls and rapids would be the result. Niagara and numerous other falls were made by this means. These falls are of great value to man, for, by their aid, power for manufacturing is obtained. This has been of very great value to the New England States.

3. *They had a Great Effect on Soils and on Surfaces over which they passed.*—The soil which existed before the ice-sheets came was removed, and in its place much glacial soil was left. Where this soil is very fine, it forms exceedingly good material for the growth of useful products, for it is a mixture of soils ground from many kinds of rocks. Where it is stony it is very difficult for agriculture. Not only are small stones found, but very often huge boulders of great size and weight are met with. They must have been carried along by the ice and left standing when the latter melted. These boulders are often interesting, for sometimes they are not of the same kind of rock as that of the neighbourhood in which they are now found. Large areas are often either devoid of soil or have only a very thin covering, and so are of little use for agriculture. This is because pre-glacial soils have been removed, and sufficient time has not elapsed since the ice age for new soils to form. The surface of the rocks has also been polished and scratched by the rock fragments held under the ice. All these scratches point towards the north, and thus are an indication of the direction from which the ice-sheets came.

EXERCISES

1. Collect pictures which show lake-covered areas and polished and scratched rocks over which the ice-sheets passed. There are often some of these in the booklets issued by the Canadian Government or the Canadian Railways.
2. Make a list of the reasons why we know that a great ice-sheet once covered the north of North America.
3. Describe the way in which the great ice-sheet made (a) lakes, (b) waterfalls.

CHAPTER V

THE DISTRIBUTION OF TEMPERATURE AND RAINFALL IN NORTH AMERICA

TEMPERATURE

THE first thing to observe is that the north coast of Canada, the greater part of Greenland, and the islands in the Arctic Ocean lie within the Arctic Circle, whilst southern Mexico is within the Tropics. Therefore the great bulk of the continent is situated in temperate latitudes. Elevation has an important influence on temperature, so we must recall that the continent contains great tracts of plains, extensive plateaus, and mountain ranges of great height. Distance from sea, too, influences temperature, and Fig. 4 shows that a considerable area is more than 500 miles from the sea. The sea takes in heat much more slowly than the land, but retains its heat for a longer period. Thus in the summer the interior of North America will have a higher temperature than the coast-lands in the same latitude, but in winter the conditions will be reversed. Coastal districts in winter have their temperature raised by the air blowing from the sea, whilst in summer the sea breezes lower the temperature. Study these figures—

Place.	Mean Monthly Temp. for Jan.	Mean Monthly Temp. for July.	Mean Annual Range.
Sydney (Cape Breton Is.) . .	21° F.	61° F.	40° F.
Fredericton (N. Brunswick) . .	12	66	54
Montreal	12	69	57
Duluth (Lake Superior) . . .	10	66	56
Bismark (on Missouri R.) . .	7	70	63
Seattle (Puget Sound) . . .	40	64	24

These places are about the same latitude, but they get farther and farther away from the Atlantic Ocean. Note (i) that the winters get colder, and with the exception of

Duluth, the summers warmer, as distance from the sea increases; (ii) the range of temperature increases with distance from the sea. The temperature at Duluth is influenced by its being on the large Lake Superior. The range of temperature at Sydney is high. Compare it with that of Seattle on the west coast and you will see at once that the latter has much more equable climate than Sydney, which is on the east coast.

Now examine Figs. 17 and 18, which give the sea-level isotherms for January and July. An isotherm is an imaginary line along which the temperature is everywhere the same. It should be noted that these maps show what the temperature would be if the continent were at sea-level. As one ascends a mountain the temperature drops about 1° F. for every 300 feet of ascent, so that in making these maps this has to be allowed for. You will see that in the January map, the isotherms bend south where they meet the land and the most southerly part of the bend is about the middle of the continent. Now compare the bends of the isotherms in July with those of January. It will be seen from the January map that a very large proportion of this continent has a temperature below 32° F. in this month. This is the temperature of freezing-point. In some Canadian cities it is the custom to make ice palaces during the winter months, and in these various amusements are held. The 32° F. isotherm does not appear in summer, excepting in Greenland. Look again at Fig. 17 and compare the temperature of the north-west and north-east coast-lands. You will at once see that the east coast is much colder than the west. Vancouver harbour is never frozen, whilst Montreal cannot be reached during the winter on account of the freezing of the St. Lawrence. The prevailing winds in each case are the westerlies, but these are sea-winds on the west and land-winds on the east. Which will be warmer? Again, the coast of British Columbia is washed by a warm ocean current, whilst the east coast has flowing past its shores the cold Labrador current from the Arctic Seas. Find these on your atlas map of ocean currents. Naturally, winds blowing over these currents have their temperatures influenced and so affect the temperatures of the lands over which they blow.

We have already compared the temperatures of Seattle and

Sydney, Cape Breton Island. The following figures are given as additional illustrations of the marked difference between the east and west temperate margins of North America—

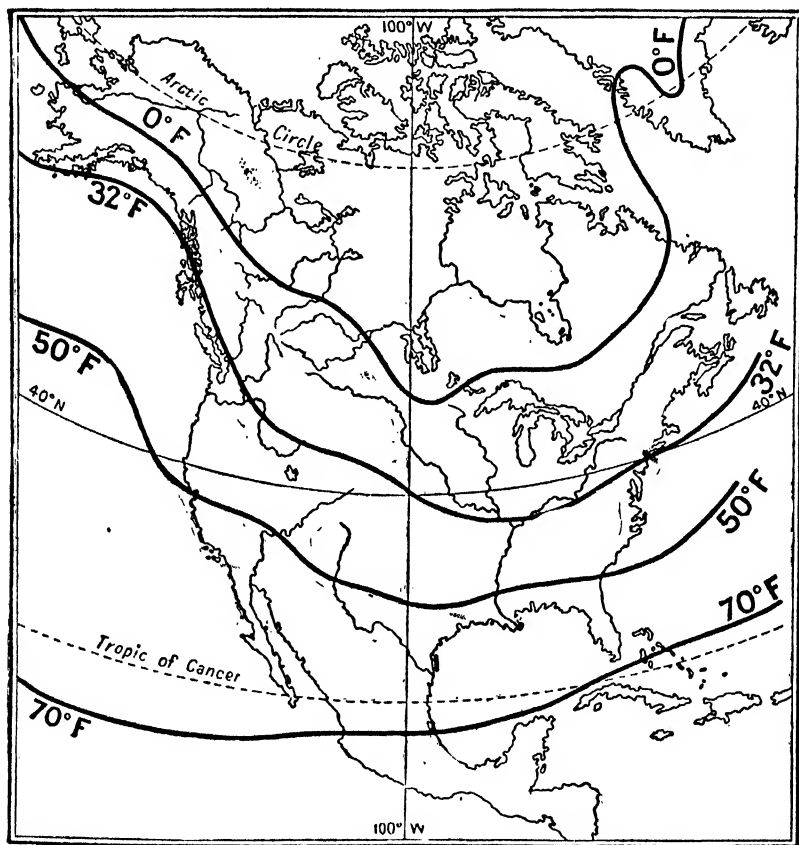


FIG. 17.—Temperature map of North America for January.

Place.	Latitude.	Mean Monthly Temp. for Jan.	Mean Monthly Temp. for July	Mean Annual Range.
{ Portland (Ore.) .	45° N.	39° F.	66° F.	27° F.
{ Victoria (B.C.) .	48	38	60	22
{ Port Simpson (B.C.) .	54	33	57	24
{ Quebec .	47	10	67	57
{ St. John (N.B.) .	47	24	60	36
{ Nain (Lab.) .	56	-7	48	55

The hottest area in summer is in the south-west, on the high Colorado and Mexican plateau. The isotherm for

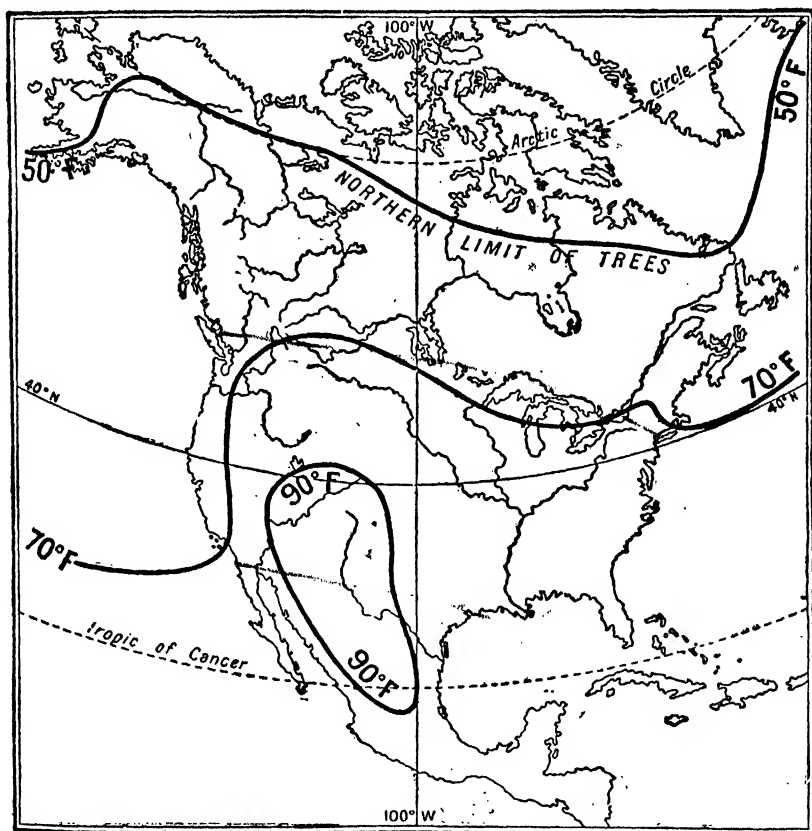


FIG. 18.—Temperature map of North America for July.

50° F. (July) is important, for it marks the poleward limit of trees, which cannot thrive unless the average temperature for at least one month reaches this amount. Notice how far north this line is.

RAINFALL

The north of North America is in the region of the prevailing westerly winds, and in the south the winds are the N.E. Trades. The westerlies are stronger but not so reliable or constant as the trades. Now keep in mind the general

build of the continent, and the general distribution of rain will not be very difficult to understand. Fig. 19 gives the seasonal distribution of the rain. The north-west coast is exposed to the westerlies all the year round, so that rain (snow in winter) will fall at all seasons because this coast is very mountainous, thus forcing the rain-bearing winds to deposit their moisture as they ascend the western slopes. Farther south along the coast is a region in which the rain falls mainly in winter. This is due to the fact that this area has westerly winds at that season and N.E. Trades in summer. Continuing southwards, we come to an area which has the N.E. Trades all the year round; and since these are dry land winds, this region, the Colorado basin, receives very little rain and is a desert. Farther south still, Mexico, too, is in the trade winds area, but these bring a copious rainfall to the east coast as they have crossed a great extent of water and are forced to ascend on meeting the eastern Sierra Madre. Mexico, however, receives most rain in summer, and this is explained as follows:—On March 21st the sun is overhead at the equator, and from that date is seen overhead at noon farther and farther northwards until on June 21st he is overhead at the Tropic of Cancer, which is $23\frac{1}{2}^{\circ}$ north of the equator. From June 21st to September 23rd the sun is seen overhead at noon nearer and nearer the equator. From September 23rd to March 21st he is seen overhead in the southern hemisphere, reaching his farthest limit south on December 21st, when he is overhead at noon at the Tropic of Capricorn. As the sun migrates northwards in our summer, and southwards in the southern summer, the lands become heated and the air above them expands and rises, creating what is known as a low-pressure area. Winds blow into this and bring rain. Therefore the rain belts follow the sun and that is why Mexico, Central America and the West Indies get most of their rain in summer. That is also the reason why the trade winds blow farther north in summer, giving California dry trade winds in summer, and therefore summer drought. (See Fig. 19.)

Now notice that the east coast from Newfoundland southwards has rain all the year round, and that as the centre of the continent is approached, the rain gradually decreases. Fig. 20 gives the mean annual rainfall, and you will see that

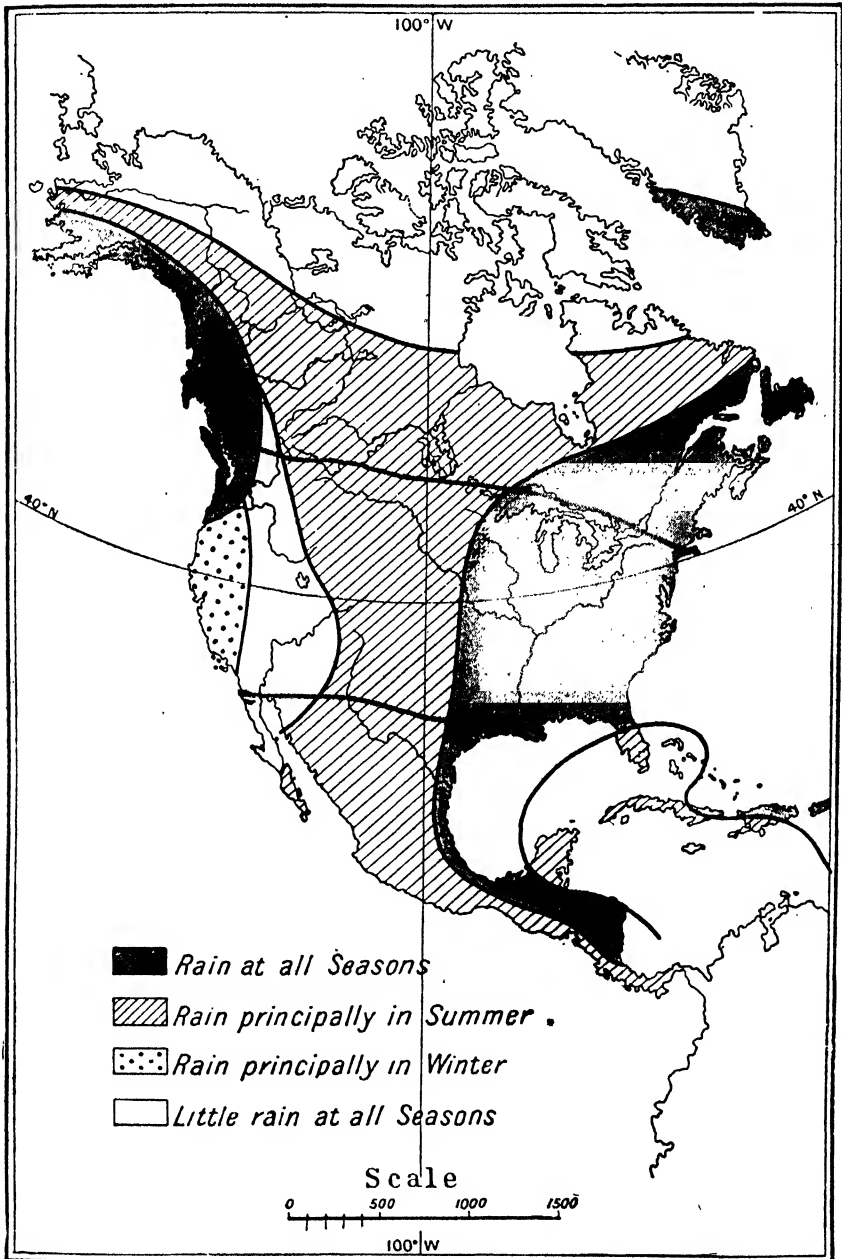


FIG. 19.—The seasonal distribution of rain in North America.

west of the line of longitude 100° W., the rainfall is small in quantity. Indeed, east of this line the central lowlands have

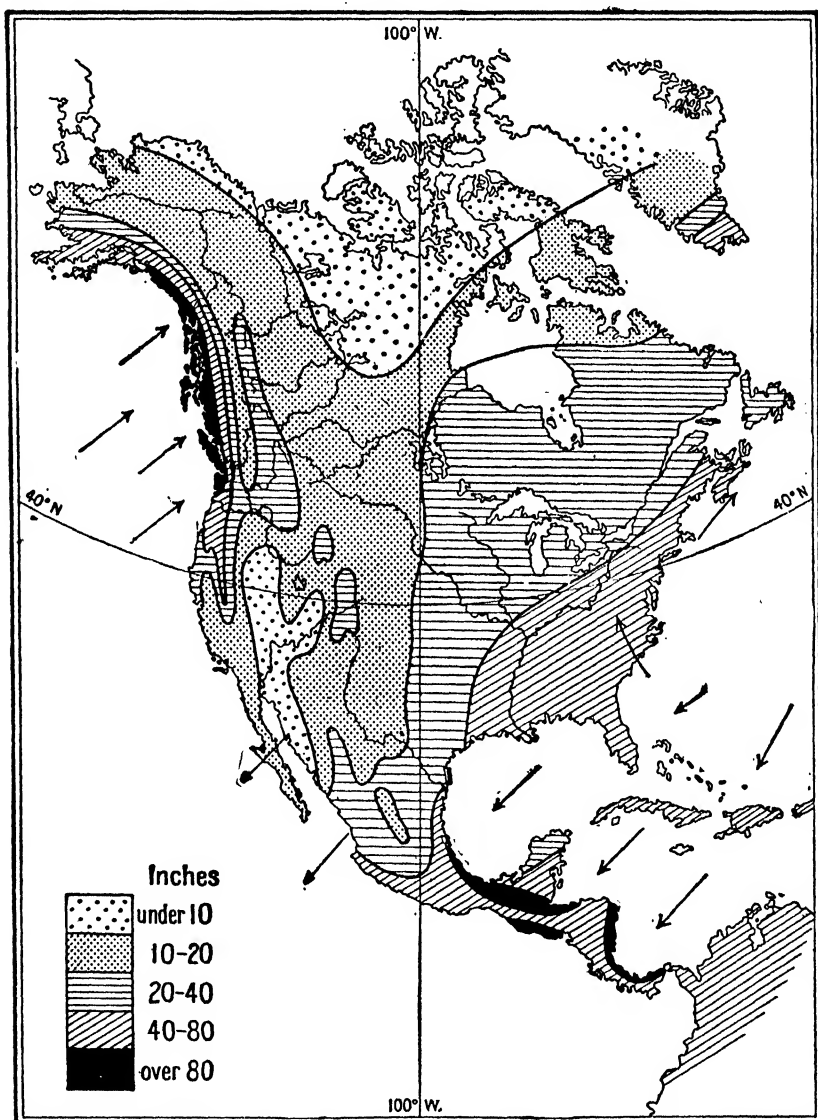


FIG. 20.—The mean annual rainfall of North America.

sufficient rain, whilst to the west the rainfall tends to be deficient. It marks a very rough boundary between lands used for

the growing of crops and those used for ranching. The central plains receive most rain in summer, when the winds from the Atlantic Ocean penetrate into the interior. The winds from the Pacific bring little or no moisture to the interior plains, as the western mountains form such a great barrier.

In the belt of little rainfall which runs at the foot of the Rockies from Canada to the Gulf of Mexico, warm dry winds from the mountains are experienced. These are known as *Chinook Winds*, which may be explained in connection with Fig. 21 as follows:—A rain-bearing wind from the Pacific Ocean meets the western slopes of the Cordillera and is forced to rise. As the air rises it expands and in doing so loses temperature rapidly. This causes rain to fall because cold air cannot hold as much water vapour as warm air. The Western Cordillera are so high that the rainfall on their windward slopes is very considerable. Of course, on the higher slopes, the moisture will be deposited

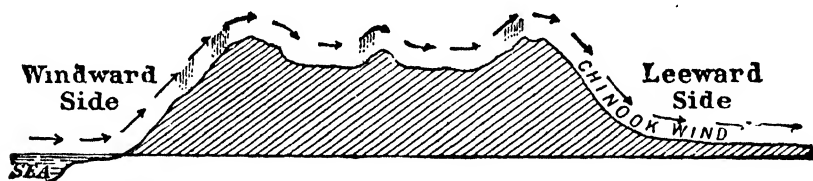


FIG. 21.—This diagram illustrates what occurs when a rain-bearing wind crosses a mountain uplift.

in the form of snow. All the rain is not forced from the air. What remains can be held, for as the air descends to the plateau it gets denser and warmer and thus is enabled to hold its moisture. Therefore these intermont plateaus suffer from insufficient rainfall. On reaching the eastern ranges, or other ranges which cross the plateau, the air is again forced to ascend and some rain falls. If you look at Fig. 20 you will see a belt of rain marking the position of the Eastern Cordillera. After crossing the Cordillera from west to east, the air descends on the leeward side to the central plain, gaining in density and temperature at a much quicker rate than it lost these in ascending. Hence it descends the leeward slopes as a warm, dry wind. Study these figures—

West Coast Towns.	Mean Annual Rainfall.	Towns East of Rockies.	Mean Annual Rainfall.
Portland (Oregon) .	46.8"	Cheyenne . .	11.9"
New Westminster (B.C.) .	61.9"	Calgary . .	14.9"
Port Simpson (B.C.) .	94"	Edmonton . .	13.9"

It should be noted that the rainfall of Portland and New Westminster is not nearly so heavy as that of the higher, more exposed western slopes of the coast ranges.

This "chinook effect" is not only true in North America, but is true of any rain-bearing wind which is forced to ascend a mountain barrier. The leeward slopes of mountains are always drier than the windward slopes. There is just one other area to notice. Look at the rainfall maps and you will see that the northern coast areas, the islands, and the greater part of Greenland get very little rain. The winds are chiefly from the Arctic regions and are cold and dry. In any case they would deposit little moisture, for they are blowing from cold to warmer regions, and therefore, as they become warmer, increase their power of holding moisture.

EXERCISES

1. Define the term "isotherm." If your school has a room containing a stove or open fireplace, spread boys about the room and let each take a temperature reading. On a plan of the room, mark the position of each boy and write at the side his temperature reading. Then draw the isotherms and write a short description of your results, accounting for any irregularities you may notice.

2. Find these places on the map of Scotland and account for the differences in temperature and rainfall. On an average how many feet of elevation lowers the temperature 1° F.?

	Average Annual Temperature.	Average Annual Rainfall.
Summit of Ben Nevis (4,400 ft.) .	31.7° F.	170 inches
Fort William	47.1° F.	80 inches

3. Examine temperature figures given in Exercise 6 on p. 130. What do they show as regards the temperature of New Orleans compared with places further north and inland?

4. Represent the following figures graphically, keeping together the first two and last three towns respectively. The graphs for temperature and rainfall must be made on separate paper, and columns should be used to represent the rainfall figures. When you have drawn the diagrams write a short account of what may be learned from them concerning the comparative climates of these towns.

MEAN MONTHLY TEMPERATURES IN
DEGREES FAHRENHEIT

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average for year.
{ San Francisco .	50	51	53	54	56	57	57	58	59	58	56	51	55
{ New York .	30	31	38	48	59	68	74	72	66	56	64	34	52
{ Victoria (B.C.) .	40	42	44	49	54	56	61	60	57	51	46	43	50
{ Winnipeg .	-7	-2	12	35	51	62	66	63	53	38	18	3	33
{ Montreal .	12	16	24	41	55	65	69	67	58	46	32	19	42

MEAN MONTHLY RAINFALL IN INCHES

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total for year.
{ San Francisco .	4.3	3.7	3.1	1.8	.8	.2	0	0.1	0.3	1.3	2.5	4.2	22.3
{ New York .	3.8	3.7	4.1	3.3	3.2	3.3	4.5	4.5	3.6	3.7	3.4	3.4	44.6
{ Victoria (B.C.) .	4.8	3.5	2.5	1.7	1.2	1.0	0.4	0.6	1.8	2.9	5.5	5.6	31.5
{ Winnipeg .	0.9	1.0	1.0	1.6	2.2	3.3	3.1	2.7	2.0	1.7	1.1	0.9	21.5
{ Montreal .	3.8	3.2	3.4	2.4	3.2	2.8	4.0	3.1	2.4	4.1	2.9	3.3	39.6

THE PLANTS AND ANIMALS OF NORTH AMERICA

THE distribution of the Natural Vegetation of North America is shown in Fig. 22. We must see how this is the result of the climatic conditions, and in some cases of the soil. As regards rainfall we may state very generally that regions where the mean annual rainfall is less than 10 ins. will be deserts; regions of over 20-25 ins. will be forested, and much of the remainder will be grass-land.

FORESTS

First, let us notice the distribution of forests. Fig. 22 shows temperate and tropical forests. If it is compared with the rainfall maps it will be seen that forests are found everywhere within the influence of rain-bearing winds from the ocean. There are no forests in the extreme north because of the lack of rain, the great cold, and the strong winds. *The Northern Forests* stretch in a belt from the Pacific to the Atlantic, extending over 3,000 miles from west to east and being about 600 miles in average width. The chief trees are spruce, aspen, larch, balsam, fir and grey pine, the first being most common and the one found farthest north. In spite of its enormous size, this forest contains few areas where the trees are of great economic value, except for the making of wood pulp, as their wood is generally of inferior quality. It must not be forgotten, though, that these forests shelter large numbers of fur-bearing animals whose skins form an important Canadian export.

The Forests of the St. Lawrence Basin and the New England States.—These forests contain the trees which have been of greater commercial importance than any on the continent. Southern extensions are found along the line of the Appalachians. In the north the trees are mainly conifers, but towards the south broad-leaved trees appear.

Conifers are evergreens, that is, they do not normally shed their leaves in winter. The leaves are like spindles or needles, so that very little surface is exposed, and this prevents the rapid evaporation of moisture by winds or sun.

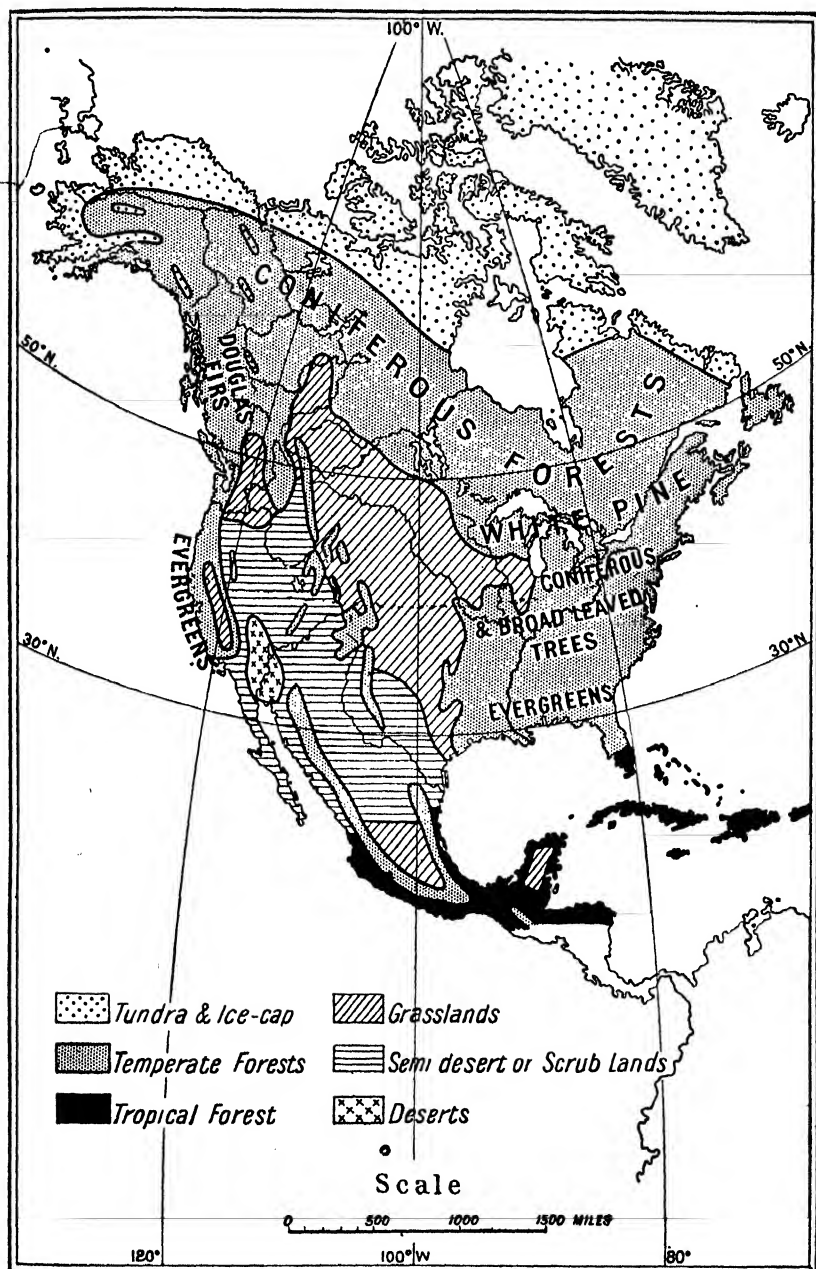


FIG. 22.—The distribution of natural vegetation in North America.

Broad-leaved or deciduous trees grow in warmer regions of heavier rainfall, and so require greater leaf surface in order to get rid of surplus moisture sent upwards from the roots. In winter these trees shed their leaves, and by this means check excessive transpiration caused by the cold winter winds. As showing how trees adapt themselves to their surroundings, it is interesting to note that in the southern states the broad-leaved trees become evergreens, that is, they do not shed their leaves in winter because the southern winters are not cold. Again, in sandy areas, even in places which have a warmer climate than is usually associated with coniferous forests, the famous yellow pines are found because of the dryness of the soil. Thus, the sandy belts of the Atlantic and Gulf Plains have conifers. Returning to the forests of the New England States and the Great Lakes and St. Lawrence Basin, it is worthy of notice that the most important tree is the White or Weymouth Pine. It is a very large tree, reaching from 70 to 150 feet in height and from 3 to 9 feet in diameter at the base. Maples, firs and spruce are also found. Sugar is obtained from the maple. South of these forests are those of—

Eastern United States.—When white men first came to North America the whole of the area marked on Fig. 22 was forested. Now, of course, great areas have been cleared and agriculture is extensively followed on lands once forested. We have already learned that in the southern areas the broad-leaved trees become evergreens and that on the sandy areas pines are found. The chief broad-leaved trees are the oak, elm, maple, chestnut, etc., and since the wood of these trees is much harder than that of the conifers, it is much used in the making of such articles as furniture, tools, carriages and farming implements. From the pines important substances, such as tar, turpentine, and resin, are obtained. Savannah, in Georgia, exports great quantities of these products.

The Pacific Forests cover British Columbia and extend along the mountains farther south, the tree limit getting higher as the equator is approached. Conifers are the chief trees (see Fig. 23), although it should be noted that evergreens of the warm temperate variety are found in the Californian region of winter rainfall, and that the forests

of the Sierra Madre of Mexico are evergreen on the middle slopes and coniferous on the highest slopes.

The famous Douglas fir of British Columbia and the redwood pines grow to enormous sizes. The former frequently attain a height of from 200 to 275 feet, with a diameter at the base ranging from 8 to 14 feet, whilst individual trees have reached a height of 300 feet. Compare this with the height of some tall building with which you are familiar.



FIG. 23.—A view in a British Columbia forest. What kind of trees are these?

The amount of timber yielded by these gigantic trees is very great. The redwoods frequently reach over 300 feet in height, with a diameter at the base of from 15 to 20 feet. The celebrated "big trees" of California should not be confused with the redwoods, although they, too, are conifers. They are found very commonly on the Sierra Nevadas, below an elevation of from 6,000 to 8,000 feet. One very tall tree measured 325 feet, whilst one of the broadest was nearly 36 feet in diameter four feet from the ground. Com-

pare this with the breadth of your class-room. In order to prevent their ruthless destruction, many of the big tree areas have been taken over by the Government of the United States. These gigantic trees enjoy a climate which is more favourable than that which usually falls to the lot of conifers.

Tropical Forests are found in southern Florida, the coastal plains of Mexico and Yucatan, and the West Indies. These forests are situated in those parts of the continent which have considerable heat and moisture. The most important trees are those which yield rubber, and cabinet woods such as mahogany and ebony.

The Animals of the Forest.—The trapping of fur-bearing animals was one of the chief occupations of the first Europeans to arrive in Canada, and is still a very important occupation in the coniferous forests of the north. The famous Hudson Bay and other fur-trading companies have depots to which the skins are brought for sale or barter, but Montreal and Winnipeg are the most important centres for furs. The chief of the fur-bearing animals are the fox, beaver, sable, ermine, mink and otter. These forests not only attract men who obtain a living by trapping, but also large numbers of sportsmen. The Governments of Canada and the United States have found it necessary to make laws which prohibit the shooting of these animals excepting at certain seasons and then in fixed numbers. The trappers themselves are white settlers, or, in many cases, Indians, and in their work they use steel traps and guns. Successful trapping requires not only a knowledge of the habits of the animals, but a healthy body, hardiness, and quickness of thought and action.

In the forests of the Rocky Mountains, large animals such as the grizzly and brown bear, the lynx and the puma are found. In the tropical forests of Mexico and Central America, where the vegetation is so prolific, there are innumerable gaudily coloured parrots, paraquets, humming-birds and insects, as well as snakes, many of which are poisonous, monkeys, and alligators.

GRASS-LANDS

Grass-lands are chiefly found in interior plains which have little rainfall. Look at the rainfall maps again, and you

will see that they receive most of their rain in summer. Thus the rain and heat come during the same season and the former is only sufficient to water the top layers of the soil. These conditions are favourable for grass, which is short rooted, and lives, forms its seed and dies, in one short season. Trees are not met with excepting near rivers where sufficient water can be obtained. The area of open land has been extended eastwards by the cutting down of the trees, so that in places where Indians formerly hunted there are prosperous farming settlements.

These great grass-lands are called *Prairies* and are very similar to the grass-lands in the interior plains of other continents. Somewhat similar vegetation is found in the Sacramento Valley and on the Mexican plateau, although large tracts of the latter are scrub-land and semi-desert.

The Animals of the Grass-lands.—Formerly great herds of bison roamed over the prairies, but they have now disappeared, being found only in Government preserves; and in their stead, horses, cattle and sheep are reared, especially in the drier lands of the west of 100° W. long. In these dry pastures the cattle roam about in a semi-wild condition and are reared chiefly for their flesh and skins. (See Fig. 33.)

The Scrub-lands.—These are found in the plateau of Idaho, the Great Basin, the Colorado Basin and Northern Mexico. They are accounted for by the fact that they are either shut off from rain-bearing winds or have dry land winds all the year round, and thus have a very slight rainfall.

DESERTS

Hot deserts are found at the head of the Gulf of California. This region receives dry land winds all the year round and thus the rainfall is very slight. Considerable areas of the north-west Mexican plateau and other adjacent areas are very little better than desert. The chief vegetation consists of different species of cacti, whose whole structure is designed for protection and to resist evaporation. Some of these grow to very great sizes.

The Tundra, known in North America as the *Barrens*, has a short, warm summer and a long, dreary winter. It is really a cold desert, for it receives very slight rainfall, and its vegetation consists of small berry-bearing bushes, mosses

and lichens. Towards the south a great variety of grasses and flowering plants are found, and stunted trees, which increase in size and number as the coniferous forests are reached, make their appearance. The reindeer is represented by the caribou, which is not domesticated, therefore there are not so many inhabitants in this area as in similar lands in the Old World. The reindeer has, however, been introduced into Alaska with considerable success. Besides the caribou, the musk-ox, the polar bear and the Arctic fox are found. The musk-ox, like the caribou and the reindeer, feeds on the berries and mosses, but the Polar bear and the small Arctic fox are carnivorous animals.

The famous Arctic explorer, Stefansson, believes that in the future the Canadian and Alaskan tundra, especially towards their southern margins, will support vast numbers of caribou and reindeer for the purpose of supplying the people of Europe and America with meat. It is by no means improbable that this development will occur.

In the Arctic seas the walrus and the whale are found. Of birds there is a very great number, amongst them being the ptarmigan, which is a land bird, and many varieties of sea birds. These birds, as well as many of the animals, migrate southwards during the winter, some of the birds reaching as far south as North Carolina.

EXERCISES

1. Describe the different types of vegetation that would be met with on a journey along the west coast of North America from Alaska to the Isthmus of Tehuantepec.

2. Give examples which show that in some regions the vegetation is largely dependent upon summer rainfall, whilst in others rain at that season is of little value.

3. Which areas in North America are deserts? What reasons can you give?

4. In which areas of North America are coniferous forests most extensive? Account for the presence of conifers in the Gulf and Atlantic plains.

5. Give some examples of the way in which plants adapt themselves to their environment.

6. Stefansson, the famous explorer, says that the North American tundra may become one of the world's greatest meat-producing areas. See p. 90 for the figures showing the great increase in reindeer in these northern lands. What do you think of this statement concerning the future of the reindeer industry?

CHAPTER VII

THE PEOPLE AND POLITICAL DIVISIONS OF NORTH AMERICA

WHEN Europeans first arrived in North America, they found that it was already inhabited, and Columbus gave the name *Indians* to the people who were living in the islands which he discovered. Those in the extreme north are now called Eskimos, a word which means flesh-eater, but with this exception, the name Indians has been given to all the natives of both the Americas. When we consider its great size, North America was very sparsely peopled at the time of its discovery. The great majority of the inhabitants had their homes either in the warmer southern regions or along the great rivers and lakes.

THE ESKIMOS

At the time of the discovery, the Eskimos, as now, lived in the cold bleak lands and islands of the far north and in Labrador, and their manners and customs have probably changed very little, except for slight alterations caused by intercourse with traders and other people who visit these lands. The climate is of such severity, and has so little to recommend it or to induce emigrants to settle there, that the people have been left practically alone. The Eskimos give themselves a very strange name, Innuít, meaning "*the people*," which implies that they consider themselves, of all people, the most important. The land, being so barren, is not capable of supporting much life, and so the natives, for most of their requirements, are compelled to resort to the sea, on which their very existence depends. For this purpose they need boats, and use a peculiar kind, called *kayaks*, which consist of a framework of driftwood, covered with seal-skins, and are propelled by means of double-bladed paddles. (See Fig. 24.) Weapons are also necessary, and the chief ones are harpoons, lances and darts, all of which are very skilfully

made. With these they hunt the walrus and the seal, which give them almost all they need for their somewhat primitive existence. As the climate is so very severe, it is essential that Eskimos should have food which gives warmth to the body, and so most of their food consists of fat, eaten in the form of seal blubber. For a change of diet they catch river fish, especially salmon. But indeed they eat any flesh which they can get, whether from seal, whale, walrus, caribou or deer. The greatest help to the Eskimos are their dogs, which are



By courtesy of the Moravian Church Mission Agency.

FIG. 24.—Eskimos in kayaks.

probably domesticated wolves. These dogs do not cost as much to support as one would think, as they eat all remnants of fish and flesh which are left by their owners. They are also as fit to stand the severe climate as the people are, and are of the greatest use in hauling sledges across the frozen land and sea. Few Eskimos are without dog teams.

In summer-time, Eskimos live in tents made of skins which are stretched upon a framework of driftwood. These tents are portable and are carried about as the people move from place to place, following their occupations of hunting and fishing. Winter is spent in houses called *igloos*, which are composed of blocks of snow and are dome-shaped. The

igloo is entered by means of a tunnel which is so low that the Eskimo has to crawl along it on his hands and knees. This tunnel, which has a skin door at the end of it, is built to keep out both the cold winds and wild animals. Where driftwood is obtainable, the roofs of the houses are made of it and then covered with snow. Clothing consists chiefly of skins which are always turned so that the warm fur is inside,

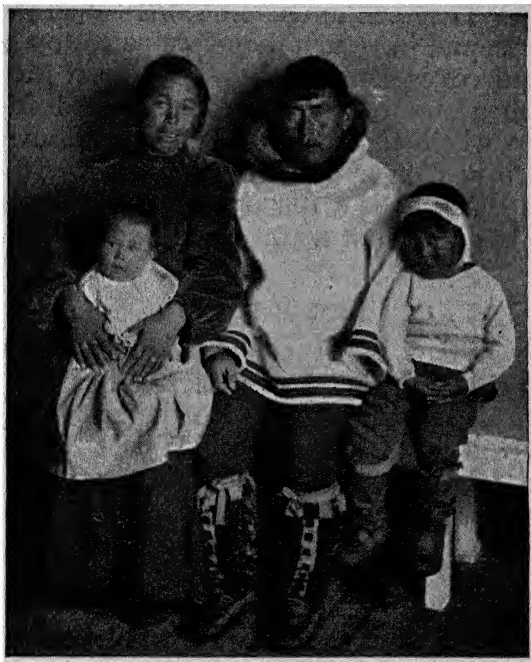


FIG. 25.—Photograph of an Eskimo family. The picture was taken in a Labrador missionary hospital. Note the different dresses.

and owing to the fact that all dress very much alike, it is often hard to distinguish men from women, or boys from girls. Sealskin is utilized in still another way, as mothers carry their babies on their backs in hoods made from it. In spite of the very unfavourable conditions under which they live, Eskimos are strong, sturdy people. Their faces are generally round, and their hair is black and straight, whilst their eyes remind one of those of the Chinese. (See Fig. 25.) In fact,

people think that long ago the natives of America came from Asia before the Bering Straits were formed.

In spite of their sturdiness, the Eskimos are slowly declining in numbers, and, sad to note, this is caused by contact with white men, from whom they obtain intoxicating liquors, and contract diseases which cause the death of considerable numbers. Not only this, but they are very gradually changing methods of living so as to be more like the white people, and many of the changes are not suitable for the climate of their country. They sell to traders skins which they ought to use themselves, and in return they receive cotton cloth, which they wear and cover tents with. They even get new kinds of food, such as flour, which are substituted for the heat-giving diet to which the race has been accustomed for ages. Thus they are in danger of slow starvation. In Greenland, trading with Eskimos is a monopoly of the Danish Government, which has also built many schools for Eskimo children.

THE INDIANS

The name Indian is, of course, due to the mistake of Columbus in thinking that he had arrived at the Indies. It is applied to all the natives of North and South America south of the lands occupied by the Eskimos. They are sometimes called "Red" Indians, and are often referred to as copper-coloured. They live over an enormous area, which contains many varieties of climate and vegetation, so that of necessity the many tribes differ from each other considerably. Generally speaking, they are brown, with a kind of reddish undertone. In stature they are fairly tall, and their hair is black, long and straight, whilst the face is beardless. The eyes are generally deep set and black, the nose usually prominent, and the mouth rather large. Add to these a prominent lower jaw and usually expressionless features. Such are the characteristic features of Indians, although it must be remembered that there are many variations in the different tribes. It should be noted that many popular ideas of Indians are incorrect. We usually think of them as splendid horsemen, trappers and scouts, and many of them are; but in these occupations white cowboys surpass them easily, as do the white trappers and trail followers.

By nature many Indians are very cruel, and the tortures

which were inflicted upon those of the early settlers who were unfortunate enough to get captured by them were very terrible. They were often cowardly, also, because their greatest cruelties were often practised upon those who could not defend themselves, whilst their mode of fighting was frequently by ambush and treachery. They are very vain, and delight in making themselves as gaudy as they can, by means of feathers, beads, claws and paint.

Both in North and South America, in the lands which have been settled by Europeans, the Indian has not been able to hold his own, and has therefore declined in numbers. In Central America, where the climatic conditions have been less suitable for white people, he has managed to maintain his position. When North America was discovered, there were tribes who were absolutely savage, others who were more advanced, and in the south-west of what is now the United States and in Mexico, dwelt tribes who had almost reached a state of civilization. In South America even more advanced tribes inhabited the high Andean plateaus.

The savage Indians were hunters and fishers only, but the more advanced added the growing of "Indian" corn and tobacco. Both, however, had no permanent homes but lived wandering lives. The dwellers of the plains lived in tents made from the skin of the bison, which roamed over the prairies in such great numbers that the Indians often killed them for their tongues and hides only. The women and children remained behind to look after the crops whilst the men fished in the lakes and rivers, or hunted on the prairies or in the forests. They had to hunt on foot, because there were no horses in America until they were introduced by white men. Had there been horses, cattle and sheep, the Indians might have lived more settled lives, for many would have become shepherds. When horses and guns were introduced, and they became very clever in their uses, the bison decreased in number at a very rapid rate. White men had also a great part in the wholesale slaughter which took place regardless of the future.

We have learned that the Eskimos are decreasing in number, due to their contact with white people. For a time this was equally true of the Indians. White men's diseases played havoc with them, for even such an illness as measles carried off large numbers of those who contracted it. It

should be noted, however, that so far as it is possible to ascertain, the Indians of Canada and the United States now appear to be maintaining their numbers.

In Central America, Mexico and south-western United States, the first Europeans to arrive found Indians much more advanced than those of whom we have just learned. In the states of New Mexico and Arizona, and in Mexico there are to-day Indians living almost the same kind of life as when first visited by Spanish explorers. This region is very arid, and thus settlers have avoided it just as they have avoided the barren lands inhabited by the Eskimos. Many of the Indians here live in very large stone or sun-dried mud-brick houses called *pueblos*. Pueblos are occupied by very many families, and look like fortresses, as they rise in terraces, which are reached by means of ladders, and have very few windows on the outside walls. A pueblo may be compared with a vast hive, sometimes containing as many as four or five thousand people, each family having a separate apartment, but all sharing the land and the products raised by careful irrigation. Pueblos are dwellings, fortresses—behind whose thick walls the occupiers could resist the attacks of wandering bands of robber Indians—and granaries.

The sites often selected were the flat-topped mesas, which easily lend themselves to such buildings. Many Indians in New Mexico and Arizona reside in dwellings built under the overhanging ledges of cliffs, whilst others occupy caves hollowed out of the solid rock.

The best known of the more advanced tribes at the time of the Spanish Conquest was the Aztec. These Indians occupied Mexico City, and had made themselves masters of the surrounding country. They mined and made various articles of gold and silver; they grew cotton, maize and sugar, and constructed irrigation works. But they had no domestic animals, and probably on this account, despite their advancement in other directions, were cannibals who sacrificed and ate large numbers of men and women. It is even said to have been the custom to attack a hostile town or district every month in order to obtain captives, who were sacrificed and eaten. Like most of the Indians, they had advanced so far as to be able to express their thoughts and ideas by means of pictures, but they were not able to write.

THE INDIAN RESERVATIONS

The Indians were driven from their hunting grounds by the settlers as they advanced westwards. This movement led to much fighting and frequent massacres of whites by Indians; but in the end the Indians were outnumbered and conquered. In Canada there are nearly 100,000 Indians, and in the United States (with Alaska) three and a half times as many. The question of their welfare has given great concern to the governments of these countries. The Indian, whilst apparently showing friendship for the white man, has generally regarded him with jealousy and suspicion. In Mexico and Central America the Spaniards and Indians readily amalgamated, and thus the struggle which has gone on in the United States and Canada did not take place there. In the latter countries the Indians have been gathered in areas known as reservations. These are situated in the east as well as the west. In Canada, some Indians still roam at will in the Rockies and the Hudson Bay forests, living as formerly by hunting and fishing, but most of them live in reservations under Government control. Where land occupied by Indians is wanted for settlement by white men, the Government buys it from the Indians and holds the purchase money in trust for their benefit. The interest and some of the capital is spent on education and in helping the Indians to follow settled occupations. There are as many as 10,000 Indian children in Canadian industrial schools, whilst very many of the men have become successful farmers and ranchers.

In the United States the problem has been more difficult than in Canada. The Indians are confined to reservations which are found in all parts of the country, but the largest is north of Texas, and is known as "Indian Territory." The aim of the Government was to help the Indians to live settled, peaceful lives, and, as in Canada, large sums of money have been spent with this object in view. Treaties have been made with the various tribes, and in many cases the Government agrees to provide each Indian with a certain amount of food and clothing. Representatives of the Government live on the reservations for the purpose of control and the distribution of these supplies. In some cases this has worked very well, and there are many Indians who work their small farms with

considerable success, and very many Indian children receive industrial training in Government schools. But in the majority of instances, this method, instead of encouraging thrift and industry, has had the opposite result of increasing their natural laziness, for the Indians know quite well that they will not be allowed to starve. The failure has not always been the fault of the Indians, because in many cases unsuitable land has been allotted to them, and in others, the agents have been dishonest in their management of the reservation. On the whole, however, the Government has done its best to deal with the Indians, and the lack of success of the reservation schemes has been due in the main to the Indians themselves. And it is not altogether to be wondered at, for it is difficult for a people with long traditions of a free life of hunting and fishing to take up settled occupations.

NEGROES

At the time of the 1930 census there were 11,891,143 negroes in the United States. That is, they formed nearly 10 per cent. of the population, and were in number 42 times as many as the Indians. They are found chiefly in the south and south-eastern states, and are the descendants of the slaves who were brought from Africa to supply the demand for cheap labour on the cotton, sugar, tobacco and rice plantations, some of which were very large. At first, some were also taken to the New England settlements, but it soon became apparent that they were best suited for work in the south. As the result of the great Civil War in 1861-5, they received their freedom. To very many of them freedom did not mean better treatment, for their owners had never ill-treated them. Those who were not so fortunate as this were generally owned by large companies, or persons who left the management of their estates to other people. The whole system was wrong, however, and it was well to change it. The problem of improving the negro is quite as difficult as that of improving the Indian. Very much is now being done by suitable methods of education. The figures below are from the *Statesman's Year Book*.

No state is entirely without negroes. In the first group they form over 10 per cent. of the total population. Notice, too, the large number of negroes in Pennsylvania, New York, and Ohio. In these northern industrial states, however, they form a comparatively small percentage of the population. There

are also large numbers of negroes in the West Indies and in some of the South American states.

State.	Number of Negroes at the 1930 Census.	Total Population.	Percentage of Negroes to total number of people.
Georgia	1,071,125	2,908,506	37
Mississippi	1,009,718	2,009,821	50
Alabama	944,834	2,646,248	36
North Carolina	918,647	3,170,276	29
Texas	854,964	5,824,715	15
South Carolina	793,681	1,738,765	45
Louisiana	776,326	2,101,593	37
Virginia	650,165	2,421,851	27
Arkansas	478,463	1,854,482	26
Tennessee	477,646	2,616,556	18
Florida	431,828	1,468,211	29
Maryland	276,379	1,631,526	17
Kentucky	226,040	2,614,589	11
Pennsylvania	431,257	2,631,350	4
New York State	412,814	12,588,066	3
Ohio	309,304	6,646,697	5

EUROPEANS

The Spaniards soon crossed the narrow lands of Mexico and Central America, and pursued their explorations northwards along the west coast. Their territories stretched northwards from Mexico to beyond San Francisco. Notice the number of names given by Spaniards, such as New Mexico, San Francisco, Los Angeles, Sacramento, Sierra Nevada, etc.

The French settled in the Mississippi and St. Lawrence basins, and left evidence of their occupations in such names as New Orleans, St. Louis, Louisville, Lake Champlain, Louisiana, etc. There is still a large French-speaking population in eastern Canada, especially in Montreal and Quebec.

The English settled along the east coast and soon gained control of other settlements made there by the Dutch and Swedes. But the present population of North America contains many more elements than Eskimos, Indians, Spaniards, French, English and negroes. Whilst in Mexico the majority of the inhabitants are of Indian, Spanish or of mixed race, in the United States and Canada there are

representatives of every European race. The threatened invasion of Chinese and Japanese was largely stopped by means of legislation, although, in spite of this, there are very many on the western coast.

The welding of such diverse peoples has been attended with very considerable success. Naturally, some return to their own countries, but they are generally those who either expected to find in North America a place where they could succeed without hard work, or, before emigrating, had insufficient knowledge of the country in which they wished to make their homes. In one of its booklets, the Canadian Government points out to prospective emigrants that its national emblem is the beaver, which is, amongst animals, the representative of intelligent industry, and that in Canada the men who do not work are looked upon with doubt. The conditions of life there all tend to and require personal effort, but what is important is, that these same conditions contribute to the success of such effort. In both Canada and the United States there is plenty of room for newcomers, and the way in which these newcomers adapt themselves to their new surroundings and the institutions which they found, form a very interesting study, especially as regards Canada, for a majority of those who make their homes there are of our own race.

POLITICAL DIVISIONS

We are now in a position to study the various parts of the continent in more detail, and we will consider them in the following order: British North America and Alaska, the United States, Mexico. It is not necessary to add more about Greenland to what we have learned in Chapters IV and VII. In South America we shall find the political sub-division is somewhat complicated, and we shall at first disregard it. In North America, however, we have very few political divisions, and in the case of Canada and the United States, these are of very great size. Notice the political boundaries of North America. The frontier-line between Alaska and British Columbia is not a natural boundary. For the greater distance it is a line of longitude, and in south-east Alaska it is a line ten leagues inland parallel to the windings of the coast. It is interesting to notice that it is impossible to tell exactly where this boundary runs, for the area has very

high mountains and a large number of glaciers. Between Canada and the United States, the boundary, from the west coast to the Lake of the Woods, is the line of latitude 49° north, after which it becomes a water boundary running midway along several of the Great Lakes and their connecting rivers. In the extreme east it is again a land boundary. Between Mexico and the United States the boundary is for 900 miles the Rio Grande, and in its western part a land boundary.

From what we have learned of the physical features, the climate, the vegetation, and the people of the continent, we shall at once see that these boundaries do not coincide with physical, climatic or vegetation units. Thus, although we shall learn of British North America, we must keep clearly in mind that the boundary between Canada and the United States does not separate different kinds of regions, for the Columbia River is very much like the Fraser; the central plains do not differ on each side of the boundary; the northern Appalachians are found in both countries, whilst it is impossible to separate the northern and southern shores of the Great Lakes.

EXERCISES

1. What have we in abundance that Eskimos lack? What do they use instead of these things?
2. Collect pictures illustrating the lives and work of Eskimos, Indians and negroes.
3. Make a list of towns, rivers, etc., which have Indian names. Are they confined to a small area or are they widespread?
4. On an outline map of the United States shade the states which have most negroes (p. 59). Use a darker shading for those states in which negroes form more than 30 per cent. of the population. Why are so many negroes found in these states?
5. On an outline map of North America print in pencil all the Indian names you can find. Print the English names in black ink, the French names in red ink, and the Spanish names in green ink. What do you learn from the distribution of these names?

CHAPTER VIII
BRITISH NORTH AMERICA

NEWFOUNDLAND

NEWFOUNDLAND belongs to the Appalachian system, from which it has been separated by sinking. It occupies an important position at the entrance to the St. Lawrence estuary, to enter which ships have to approach by the Strait of Belle Isle or Cabot Strait. In area it is rather larger than Ireland. Notice the comparative straightness of the western coast and the north-western peninsula. Your map will also show many smaller peninsulas, all of which take the same direction. The island shows very many traces of glaciation and much of the surface resembles the Hudson Bay area in having a large number of lakes and morainic hills.

The interior is a low plateau whose prevailing vegetation is coniferous forests. These forests supply very many paper-mills with wood pulp. But the chief wealth of the island is in its fisheries. Look at Fig. 26, which shows that off the shores of eastern Canada there are extensive areas of shallow seas. Notice the position of the Grand Banks. These fishing grounds are larger than Newfoundland itself and are probably the most important in the world. They are portions of the continent which have been sunk below sea level and may be compared with the shallow seas which surround the British Isles.

These gently sloping submerged platforms between the 100 fathom line and the sea-coast are known as "Continental Shelves." Beyond the 100 fathom line the slope of the sea bed increases much more rapidly. Fig. 26 shows that the St. Lawrence River is continued by a deep channel which can be traced right to the edge of the continental shelf. This is the old bed of the St. Lawrence. Flowing past the shores of Labrador and Newfoundland is a cold Arctic current, called the Labrador current, which deposits on this sub-

merged platform the tiny organisms which form food for fish, chief amongst which are cod and herring. The Grand Banks are often covered by fogs which are due to the cold

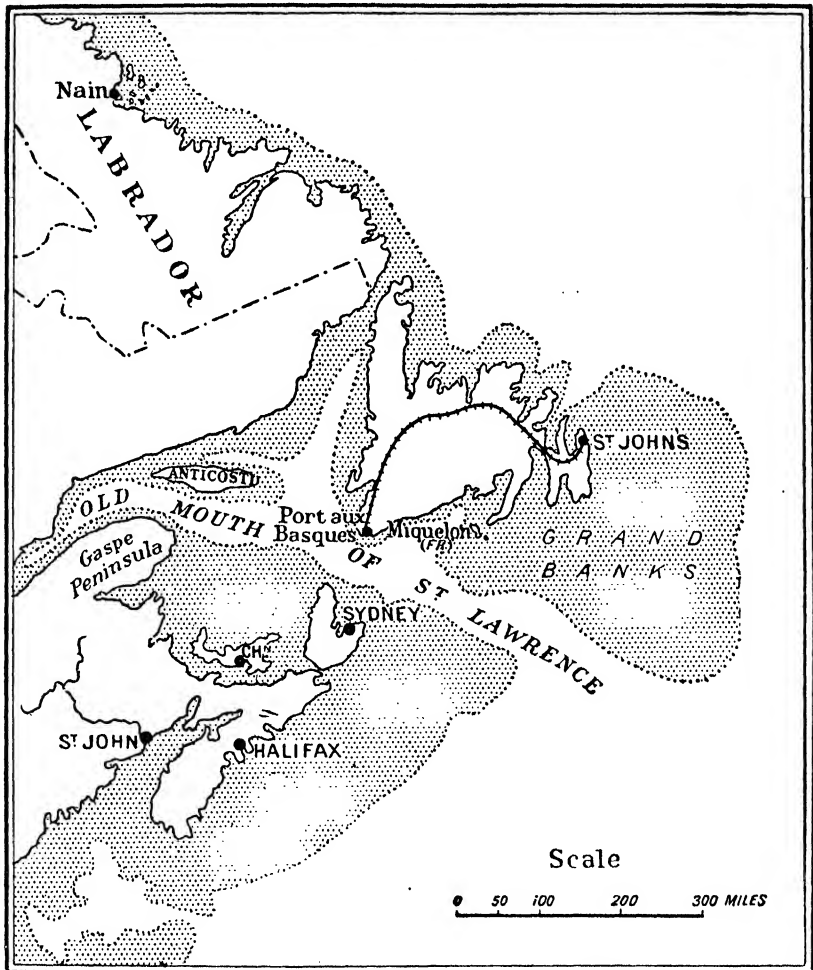


FIG. 26.—The fishing grounds of eastern Canada. The shaded parts of the sea are less than 100 fathoms in depth.

air from over the Labrador current meeting the warmer air from the Gulf Stream drift. In spring, Newfoundland fishermen visit the coasts of Labrador for seal catching. The

seals rear their young on the frozen sea or ice-floes, and when these drift southwards with the Labrador current, and break up owing to the increasing warmth and the coming of spring, the strongly built ships of the sealers push their way among the broken ice-fields. Upon reaching a number of seals, the men run on the ice and kill as many as possible, afterwards returning to each in order to obtain the blubber and skin. Here it should be noted that the seal which gives the skin that is so much prized for warm winter clothing is only found in Bering Straits. Sealing is dangerous work, for sometimes men cannot get back to their boats and so perish on the ice. When the sealing season is over, many of the most strongly built ships make journeys farther northwards in order to search for whales. The Grand Banks fishing season usually lasts from June to November and engages at least 50,000 men. *St. John's*, which is the capital of Newfoundland, has miles of wooden erections, on which the cod are salted and dried in the sun, and is the chief fishing centre of the island, although many fishermen from ports on the mainland are also engaged.

Besides its fisheries and its forests Newfoundland has considerable mineral wealth, although at the present time little mining is carried on. Some iron which is mined near *St. John's* is exported to Sydney in Cape Breton Island, where there are large ironworks.

St. John's is connected by rail with Port-aux-Basques on Cabot Strait. Near to Capes Race and Ray are wireless stations which receive messages from Europe. The small islands of *St. Pierre* and *Miquelon* belong to the French and are used by them as fishing centres.

Newfoundland, which does not form part of the Dominion of Canada, also owns Labrador, whose population of 4,000 are chiefly Eskimos.

EXERCISES

1. Account for the great fishing industry of Newfoundland.
2. Explain the term "continental shelf." Draw a map to illustrate your answer.
3. Who discovered Newfoundland? Read in other books an account of the earliest attempts to colonize the island.

CHAPTER IX

THE MARITIME PROVINCES OF CANADA

THE maritime provinces of Nova Scotia, New Brunswick and Prince Edward Island, together with the New England States of the United States, form part of the northern Appalachian system. We have learned that these areas, unlike the southern Appalachians, have been glaciated and in many places worn down to a rough plain or peneplain. Lakes and waterfalls are common everywhere, whilst there are many morainic deposits. Look at the map and see how portions of the maritime provinces are almost separated from the remainder of Canada. Yet these parts are of the utmost importance to the Dominion, for here are the winter ports of Halifax and St. John. The latitude of these provinces is that of southern France, and yet the summer climate is like that of northern England, and its winter climate comparable with that of Sweden. Being on the east coast, the climate is more extreme than in similar latitudes on the west coast. Notice the funnel-shaped Bay of Fundy. The height of the tide is so intensified that in the Minas Basin, the more easterly of the openings at the head of the bay, the difference between high and low tide is about 70 feet. Fertile silt is deposited by these high tides, and this is used as a fertilizer, no artificial or other fertilizer being required. The River St. John enters an arm of the Bay of Fundy over a ledge 15 feet in height. When the tide rises, not only do the falls disappear, but the sea water rushing upstream gives the appearance of rapids in the opposite direction from that in which the river flows.

The wealth of the maritime provinces lies in their fisheries, forests, minerals and agriculture. Cod, lobsters, mackerel and herring are the chief fish caught. In 1933 the value of the fish catch in Nova Scotia was 6,010,000 dollars, and

20,500 men were employed in the industry. In the same year the value of the New Brunswick fisheries was nearly 3,061,000 dollars and about 10,000 men were employed.

The forests are of greatest importance in New Brunswick, where lumbering is an important occupation, especially in the valley of the St. John River. The chief trees are spruce, fir, hemlock, pine and cedar, and the most important saw-mills are at Fredericton and St. John.

Mining is most important in Nova Scotia, in which province it ranks next to agriculture in importance. There are coal and iron fields in Cape Breton Island, where you will remember the iron ore brought from Newfoundland is smelted at Sydney. In 1891 Sydney had only 2,426 inhabitants, whilst in 1931 it had 23,000; so you will see the iron trade has grown very considerably. Coal and iron are also mined at Picton in the north of Nova Scotia. The coal deposits are owned by the State, which leases the mines to companies, and the revenue derived from this source pays half of the taxes required by the provincial government.

Agriculture is the most important occupation in the Maritime Provinces. Wheat is not grown in great quantities, because it can be bought more cheaply from the prairie states. Oats, barley and root crops, especially potatoes, are the chief field crops. Fruit in great quantities is produced, the apples of the sheltered valley of Annapolis, in western Nova Scotia, being very famous. The average annual yield exceeds one million barrels. It is interesting to note that Annapolis is the oldest town in North America, north of Florida. Cherries, peaches and plums are also exported. Mixed- and dairy-farming are great features in the Maritime Provinces, especially in Prince Edward Island, which has been described as the "million acre farm." The majority of these farms are situated in areas that have been cleared of forests. Every help is given to the farmer by means of model farms and travelling schools of instruction, the cost of which is borne by the provincial governments.

Silver fox raising is a very interesting occupation—one of the important ones—of Prince Edward Island. In 1933 there were 609 farms, with animals worth over a million dollars. Other animals (chiefly mink, skunk and muskrat) are also reared on farms in Prince Edward Island and other

parts of Canada. In the season 1933-34 the value of the pelts of Canadian ranch-bred animals represented 34 per cent. of the total value of the raw fur production of the Dominion. There were 5,500 fox farms and 966 other fur farms in the Dominion.

The chief towns.—*Halifax* and *Sydney* are the largest towns in Nova Scotia. The former stands on a peninsula which projects into a splendid harbour, and is an important winter port, being ice free at that season. You will recall that during the winter months the St. Lawrence is frozen, so that Montreal and Quebec cannot be reached by steamer. Halifax is the chief naval station of eastern Canada, an eastern terminus of trans-continental railways, and the capital of the province. Sydney, in Cape Breton Island, is an iron and steel manufacturing town.

Charlottetown, the capital of Prince Edward Island, has a good harbour, and is the centre of the island's mixed- and dairy-farming industry.

St. John and Fredericton are the most important towns of New Brunswick. The former disputes with Halifax the honour of being Canada's premier winter port. It is ice free, and is, like Halifax, an eastern terminus of the great trans-continental railways. Fredericton, the capital of New Brunswick, is an important lumbering centre.

EXERCISES

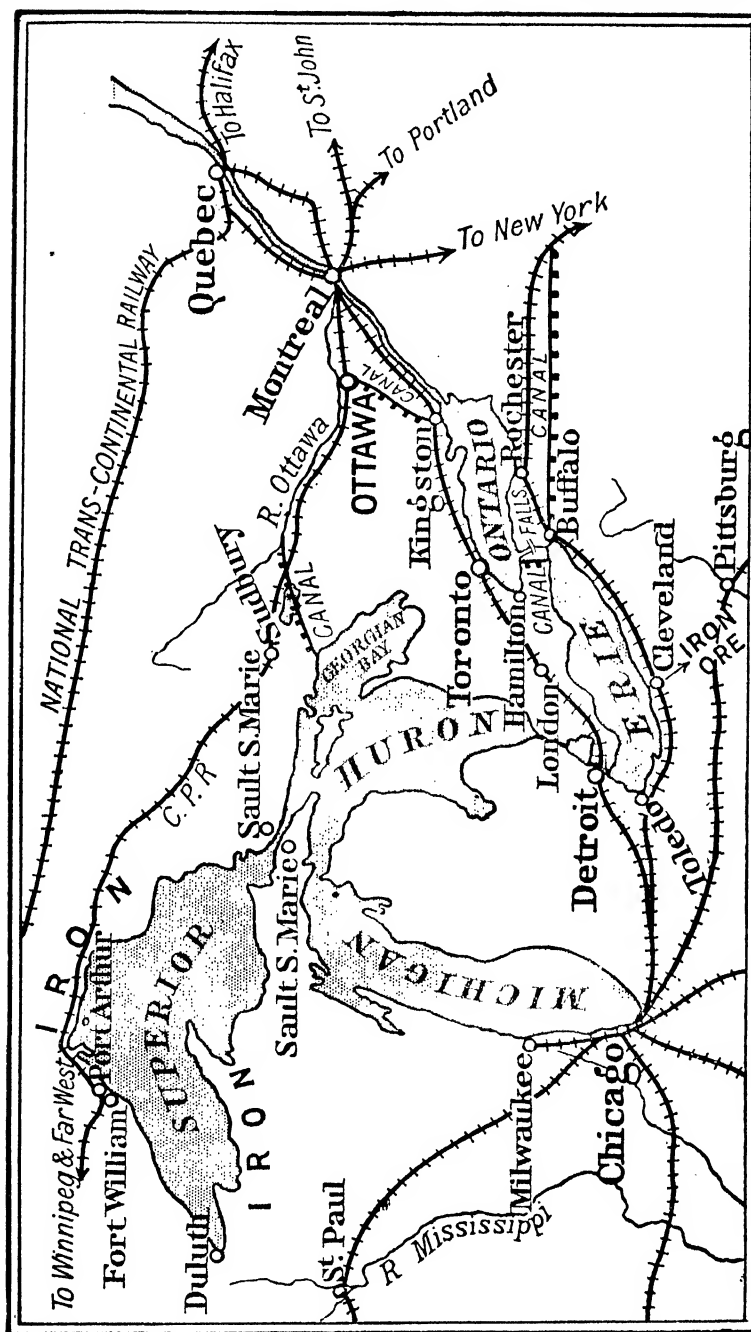
1. Read Longfellow's "Evangeline." Where is the country of Evangeline?
2. Why is it that Halifax and St. John are the chief winter ports of Canada? Compare the advantages of each for the position of Canada's premier winter port.
3. Halifax is one of the oldest cities in Canada. Can you suggest reasons why it has not grown into a very large city? At the census of 1931 its population was 58,939; in 1921, 58,372; in 1911, 46,619; and in 1901, 41,000.
4. "Two of the four great sea-fishing areas of the world border on Canada." Which are the two and which the four? What other great resources of fish has Canada?

CHAPTER X

THE BASIN OF THE ST. LAWRENCE AND THE GREAT LAKES

AT the western end of Lake Superior is the American lake port of Duluth, near to which the St. Louis River enters the lake. This river is the head stream of the St. Lawrence, which drains the five great lakes, Superior, Michigan, Huron, Erie and Ontario (see Fig. 27). Lake Superior is the largest sheet of fresh water in the world, its area being about the same as that of Ireland. The heights of these lakes above sea level in the order given above is 602 feet, 578 feet, 576 feet, 566 feet, 245 feet. You would, therefore, expect to find hindrances to navigation in the form of rapids or falls between Lakes Superior and Huron, and between Lakes Erie and Ontario. In the former instance there are the rapids of the short St. Mary River, whilst in the latter the Niagara Falls account for about 160 feet at one drop. Compared with their size, the Great Lakes are very shallow, for in spite of their considerable depth, if the water could be removed, their beds would have the appearance of plains. The St. Lawrence and Great Lakes waterways, with their canal systems, form a magnificent way right to the heart of the continent, and compete very successfully with the railways. When the proposed canal from the Georgian Bay of Lake Huron to Ottawa is built, the routes from Lake Superior westwards will be very considerably shortened, and even some United States produce will find its outlet along the St. Lawrence.

Formerly the greater part of this area was forested, the chief trees being mainly coniferous in the north and coniferous and deciduous in the south. To-day the agricultural areas are in the extensive forest clearings. If the cargoes of boats passing through the Sault Ste. Marie or "Soo" canals, which avoid the rapids of the St. Mary River, were examined, they would be found to consist mainly of wheat, timber, and iron ore. The wheat would be coming from



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Fig. 27.—The Great Lakes and the St. Lawrence.

the ports of Duluth (U.S.A.) and the Canadian twin ports of Port Arthur and Port William. It is brought to these ports by rail from the prairie farms farther west and stored in grain elevators, ready to be transferred to specially made steel grain boats called whalebacks. The iron ore is very largely obtained from the rich iron mines on the southern shores of Lake Superior, and is on its way to such towns as Cleveland (U.S.A.), on the southern shores of Lake Erie, either to be smelted there or sent on to Pittsburg.

Reference has been made to the "Soo" canals which avoid the rapids of the St. Mary River. There are three, two American and one Canadian, and these canals carry more than four times the tonnage of the Suez Canal. There are two towns named Sault Ste. Marie—one on the American side and the other on the Canadian side.

Sudbury, north of Lake Huron, on the main line of the Canadian Pacific Railway, has very rich deposits of nickel and copper. Eighty-five per cent. of the world's supply of nickel comes from Ontario. This province is also the world's chief producer of cobalt and in addition possesses rich stores of silver, gold and iron-ore. Indeed, Ontario is easily first among the Canadian provinces in respect of its mineral wealth. Unfortunately no coal is mined in Ontario and Canadian coal-fields (Alberta, British Columbia and Nova Scotia) are far away. Fortunately there are enormous quantities of "*white coal*" which is extensively used in modern electric smelters.

Between Lakes Huron and Erie is the St. Clair River which passes through a small lake of the same name. Lake Erie is the next lake, and between it and Lake Ontario, which is the smallest of the Great Lakes, are the great Niagara Falls, to avoid which the Welland Ship Canal has been constructed.

NIAGARA FALLS

Figs. 28 and 29 show diagrams of the falls. They are divided by Goat Island into the American and the Canadian, or Horseshoe, Falls. The former is 1,060 feet wide and 167 feet high, whilst the latter is 3,000 feet wide, but 9 feet lower than the American fall. After tumbling over the brink, the water rushes through a gorge seven miles long. We have seen that Lake Erie stands on a platform which is higher than the level of Lake Ontario. This

platform, or upland, ends in a steep face which is called an escarpment. When the falls first began, and you will recall that this was after the great ice sheets had receded, they would be over the edge of this escarpment. Since then they have cut their way upstream, thus making this seven-

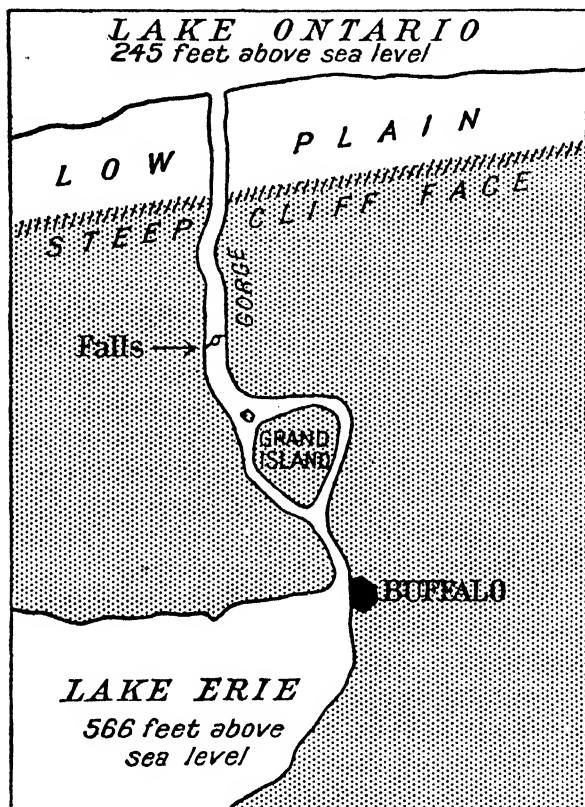


FIG. 28.—This diagram shows the position of the Niagara Falls. Where were the original falls? What will happen when they cut back to Grand Island?

mile gorge. The way in which they have done this is illustrated in Fig. 29. You will notice that the top layer is made of limestone, which is a hard rock compared with the layers of shale. The softer shales, which are more easily worn than the harder limestone and sandstone, thus get cut back, especially where the force of the water hurls the rock frag-

ments against them with great force. The harder rocks fall as they get undercut, and so the falls recede at a rate which at present is estimated at one foot each year.

The falls are an enormous source of power. Some of the waters above them are deflected into sluiceways and tunnels, and the power derived from these is used in driving machinery to generate electricity, in order to supply heat and power to the towns of the neighbourhood. Cheap power from Niagara is used even so far away as Buffalo and Toronto, for one of the great advantages of electricity is that it need not be used just where it is generated.

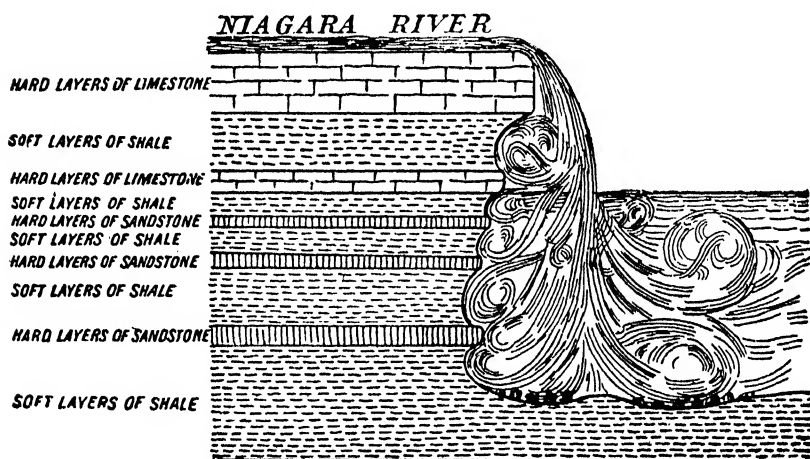


FIG. 29.—Diagrammatic section of Niagara Falls (after Gilbert).

THE LAKE PENINSULA

Examine Fig. 27, and it will be seen that part of the province of Ontario has water on three sides. This is the most southerly part of the Dominion and is known as the Lake Peninsula. Which countries of Europe are in the same latitude? You will, therefore, expect this part of Canada to enjoy a more equable climate than its position so far from the sea would warrant. The winters are not so cold as at Montreal, and the summers are cooler. The soil is very fertile, giving great variety to the vegetable productions.

For these reasons it is not surprising that the Lake Peninsula is the most densely peopled part of Canada.

The chief occupation is agriculture, and although wheat is largely grown the farming generally is of a more "mixed" type than that of the Prairie Provinces. The rich pastures support large numbers of cattle, and dairy farming is an important occupation. Horses are reared in great numbers, and in connection with this occupation it should be noted that oats, which are largely used in horse-rearing, are the chief crop in the province of Ontario. The Lake Peninsula has been described as a vast fruit farm. Certainly its peach orchards and vineyards constitute one of the sights of Canada. The apple crop is exceedingly large. Modern methods of cold storage and of transport in refrigerator cars are working wonders with the fruit trade of this part of the Dominion.

The chief city is *Toronto*, which has many industries, including the making of agricultural implements, ship-building, biscuit making, etc. It has an excellent position on Lake Ontario at the point where the routes from Georgian Bay reach that lake, and is the centre for many railway and steamer routes. Other Lake Peninsula towns are *Hamilton* and *London*, both of which are on the Grand Trunk Railway from Quebec to Chicago. Hamilton rivals Toronto as a lake port and railway centre, for its position at the western end of the lake gives it more facilities for railway connections, especially with the United States. London is a growing agricultural centre with important manufactures.

THE LOWER ST. LAWRENCE

Near the eastern end of Lake Ontario is the town of *Kingston*, from which a canal, the Rideau, has been constructed to Ottawa. The river leaves Lake Ontario in a very broad channel so studded by wooded islands that it is called the Lake of the Thousand Isles. It is here that the name St. Lawrence is first used for the river.

Montreal.—About 160 miles from Lake Ontario is the island of Montreal, on which stands the important town of the same name. This name is derived from the Mount Royal which rises as a background for the city. It is the largest city in Canada, and is still rapidly growing. Between the island and the right bank are the Lachine Rapids. River

boats can go downstream, but the rapids form a barrier for steamers proceeding upstream, so that it has been necessary to cut the Lachine Canal through the island. Now let us consider the causes which have led to the great importance of this city.

In the first place, it is situated at the farthest point up the river that can be reached by large ocean-going vessels, and is 300 miles nearer Liverpool than New York. Therefore at this point there will be a transference from ocean vessels to river vessels and *vice versa*. It is here that the ocean vessels are loaded with the products of the interior.

Many water and land routes converge upon Montreal, and in this connection you should study Fig. 30 and the map in your atlas. Notice particularly the routes following the main stream and the valleys of the Ottawa and the Richelieu. The map shows that Portland is the nearest ice-free port to Montreal, and, from a Canadian standpoint, it is unfortunate that it is not a Canadian port.

The natural advantages of site possessed by Montreal have combined to make the city the largest in Canada, and if it were not for the fact that the St. Lawrence freezes in winter, the city would probably be the greatest on the continent, for it is 1,000 miles from the mouth, and therefore there is a saving of carriage charges for water transport as compared with land transport, whilst behind it there is a water route by which large river and lake boats can proceed for another 1,200 miles right into the heart of the continent.

Thus railway and water routes bring to Montreal products from all points of the compass, either to be manufactured there by the cheap power supplied by the Lachine Rapids or shipped to other countries, whilst it is the principal distributing centre for the country's imports.

The Ottawa Valley.—The Ottawa River, which forms the boundary between the provinces of Ontario and Quebec, flows through one of the finest lumbering areas in the world. In these forests the commonest trees are conifers. Lumbering parties go to the forests in autumn and remain there during the winter, which is a season of hard trying work, for the cold is very intense. Snow covers the ground and gives the means of making easy roads for the haulage of the logs to the river. The trees ready for felling are cut down, the small branches lopped off, and the trunks then dragged by

horses to the nearest river. The rivers are frozen, and thus it is possible for the logs to be piled up on the ice. When spring comes the lumbering season ends. The rivers, swollen by the melting of the snow and ice, carry the logs along towards the saw mills, which are generally placed near to falls or rapids on account of the power which these make possible. It is always best to let the logs go as far down the rivers as possible, even to their mouths. We often find towns, where the timber is sawn up and made into many

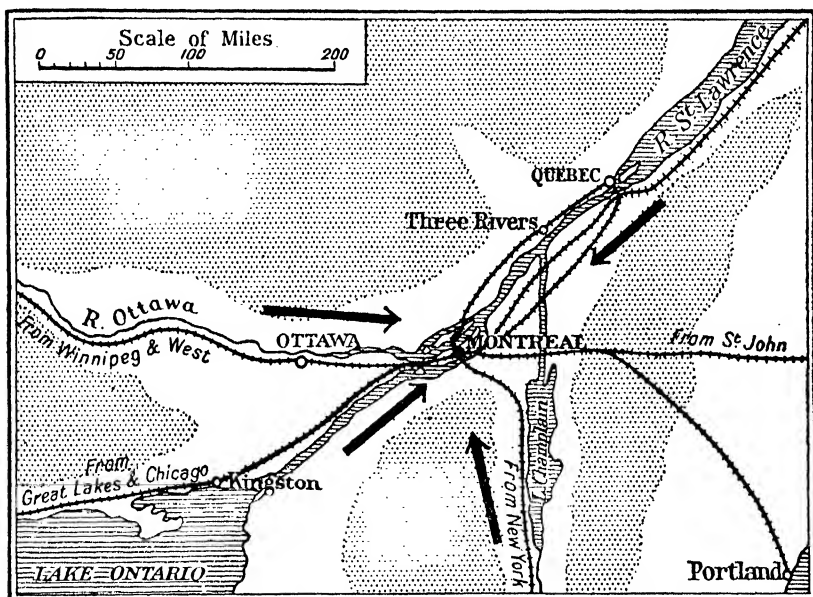


FIG. 30.—This figure shows the importance of the position of Montreal at the meeting place of great land and water routes. Its unrivalled communications with the wheat lands of Central Canada and the United States have made it the greatest wheat port in the world.

useful articles, placed at the point where the current is not strong enough to take the logs farther.

In recent years lumbering has somewhat declined in Eastern Canada. The cutting of pulping timber and the manufacture of paper have, however, both increased. Many industries based on wood and paper have sprung up and to-day employ some 100,000 workers. Artificial silk, linoleum, dynamite and gramophone records (made from wood flour) are some of these.

Ottawa, the capital of the Dominion, is on the right bank of the Ottawa River, at a point where that river is joined by a tributary, and is the chief lumbering centre in Canada, its lumber, pulp and paper mills deriving power from its two rivers. It is a very handsome city and is constantly being improved, for the Government allows an annual grant for that purpose. The Parliament Buildings are amongst the finest of their kind in the world, and much resemble the

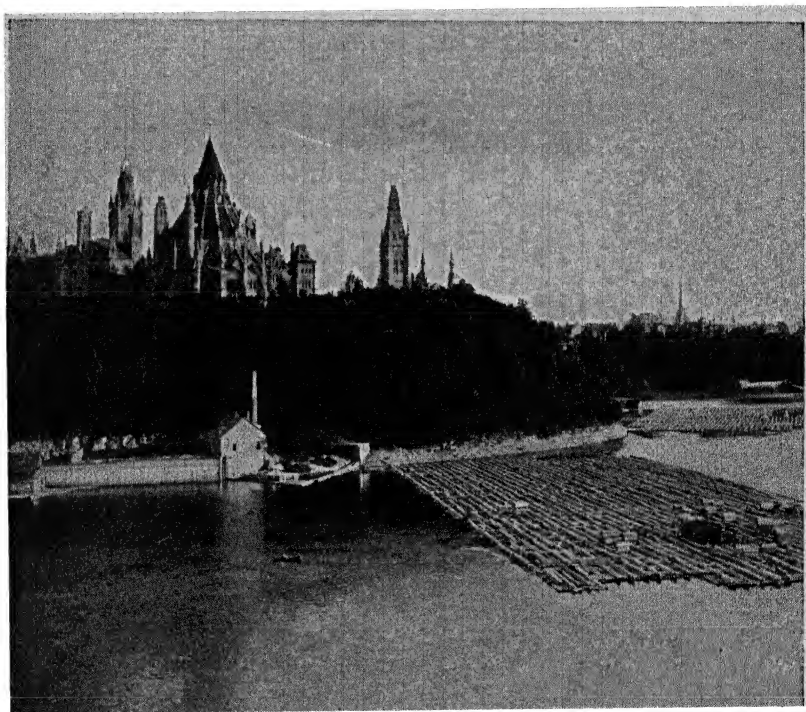


FIG. 31.—View of the Parliament Houses, Ottawa. Notice the pine-covered slopes of the high ground on which the Parliament Buildings stand, and the lumber rafts in the river. Note the huts on the rafts.

Houses of Parliament at Westminster. (See Fig. 31.) Ottawa became the capital in order to avoid jealousy between Toronto, Montreal and Quebec. The provinces of Ontario and Quebec contain more than half of the population of Canada, so that the original advantage of being in a central position still holds good. Aided by two small canals, there is steamboat connection between Montreal and Ottawa. In

the future, when Ottawa is joined to the Georgian Bay of Lake Huron by canal, it will be possible for large steamers to reach the western end of Lake Superior along this short route.

On the river opposite Ottawa is the rising lumbering town of Hull.

The St. Lawrence below Montreal.—Continuing our journey towards the mouth of the St. Lawrence from Montreal, we notice that the banks of the river are lined with prosperous farming communities.

The farms are noted for their ribbon-like narrowness. They were so made in order that each settler should have a water-front from whence he could travel by boat or canoe and market his products or bring house supplies. Fruit and vegetables, live stock and dairy produce are the chief products. Canada is the world's greatest cheese-producing country, and the province of Quebec is the chief one engaged in this industry.

Formerly Quebec was covered by forests, and in the first stage of the economic development of the province hunting and trapping predominated. At a later stage lumbering took the first place, and large areas of forest lands were cut. Then the cleared land was utilized for agriculture. Coal and iron are not mined in Quebec, but there is abundant water power for the modern lumbering, pulping and paper-making industries as well as for the busy factory industries of the towns. Thus the economic development has reached the manufacturing stage. Asbestos is the chief mineral of Quebec. The province produces no less than 85 per cent. of the world's output of this valuable mineral.

Quebec, next to Montreal, is the most important town on the Lower St. Lawrence, and has played a very important part in Canadian history. The word Quebec is an Indian word for "narrows," a name which is very suitable, for at this point the river narrows to about three-quarters of a mile in breadth. This is due to a promontory projecting into the river on the left bank. Below Quebec the river widens very considerably, and there is no bridge nearer the mouth than the new magnificent one near Quebec. The older part of the city, including the citadel, is built on the heights, and thus commands the river with ease. Indeed, it

is one of the finest natural positions for a fortress on the continent. (See Fig. 32.) Old Quebec is most interesting, for it is like a bit of the old world placed amidst modern surroundings. The modern commercial city is on the lower ground at the foot of the heights. Quebec has lost its old importance as Canada's first lumbering centre because of the growth of such towns as Ottawa and Hull in positions nearer

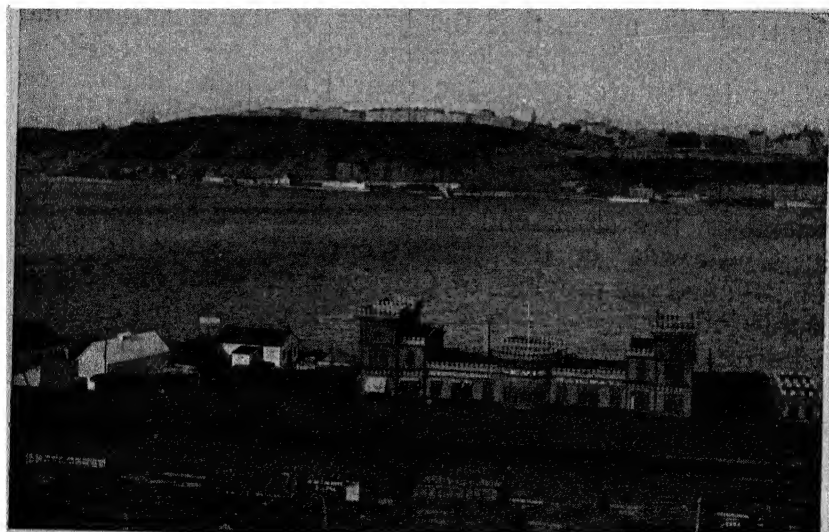


FIG. 32.—View of Quebec from Levis, a town on the opposite side of the St. Lawrence. Notice the citadel on the Heights of Abraham, and the modern port at the river level. The magnificent new bridge crosses the river a few miles above Levis.

to the best lumbering areas and with great sources of power. There are still many lumber and pulp mills, but it is even more noted for its leather manufacturing, including boots and shoes. It is bound to increase in importance as a port, for it is the eastern terminus of the National Trans-continental Railway, which offers a more direct route across the continent than that of the older Canadian Pacific Railway. Next to Montreal, Quebec is Canada's chief summer port.

Below Quebec, the river gets broader and broader, being about 25 miles wide at Rimouski, a small port on the right bank whose pier extends nearly a mile into the river. Steamers take on or leave mails at this point.

It has been proposed to make a further outport at Gaspé on a bay of the same name. The advantage of outports such as Rimouski and Gaspé is that mails and passengers can be picked up or set down there, and time can be saved owing to the superior speed of the railway train compared with the steamer. Notice, in your atlas, the large wooded island of Anticosti, and trace the old course of the St. Lawrence right across the continental shelf to the deep waters of the Atlantic.

EXERCISES

1. Draw maps to show the position and importance of Toronto, Ottawa, Montreal and Quebec.
2. Describe a journey in a lake steamer from Port Arthur to Montreal, mentioning where there are obstructions in the course of the river and how these are avoided. Draw a section to show the different levels.
3. What do you mean by saying that the Niagara Falls are cutting their way back upstream? Explain by means of diagrams what evidence there is of the work they have already done in this direction.
4. Imagine that you are spending a month's holiday in a lumber camp. Write a letter to a friend describing the work that is taking place. If you can, enclose a few "photographs" (pictures from guide-books, etc., to be pasted in note-book).
5. Draw a map of the basin of the St. Lawrence, marking and naming the Great Lakes; Niagara Falls; the "Soo," Welland, Rideau and Erie Canals; the chief towns in the basin; the chief seats of the fruit-growing, lumbering, and iron-mining industries.
6. "It is an important and extremely fortunate fact that a large amount of Canada's accessible water power is situated in a part of the country where native coal is not conveniently or economically available." Which part of the country is referred to? Give reasons.
7. Read again the section "The St. Lawrence below Montreal" (page 77). Give another reason for the ribbon-like narrowness of the farms.
8. Montreal is the world's greatest grain port and one of its greatest fur markets. Account for this.

THE HUDSON BAY REGION

TURN in your atlas to the physical map of Canada. The Hudson Bay Region is a physical unit bounded in the west and south by a chain of lakes. On the west the chief lakes are Great Bear, Great Slave, Athabasca and Winnipeg. The southern boundary is marked by the chain of the Great Lakes and the lower St. Lawrence.

Hudson Bay has been formed by sinking, and forms the lowest part of this region. The whole may be compared with a saucer, the lowest part of which is represented by Hudson Bay, and the edges of the saucer have been broken at Hudson Strait and at the channels between the islands to the north of Hudson Bay. We have already learned that this is the oldest part of the continent, and that it consists of an ancient highland area which has been worn down to a rough plain. The lakes which skirt its western and southern edges have been formed where the hard rock of this ancient area meets the softer, more soluble rock of the central plains. (See Fig. 7.) Notice that the area within this lake fringe is dotted by lakes of all sizes. These owe their existence to the great ice sheets which long ago covered this part of North America and in many cases they occupy hollows scooped out of the solid rock. This region of ancient rock is known as the *Canadian Shield*.

In the north the Canadian Shield consists of sparsely inhabited barren lands or tundra. The rest is mainly coniferous forests, excepting in the south, where some areas have been cleared and agriculture is carried on. Hunting and trapping are the chief occupations in the valleys of the rivers draining into Hudson Bay. The Hudson Bay Company has stations at such places as Churchill at the mouth of the River Churchill, and York Factory at the mouth of the Nelson River. Here the skins of the deer, fox, ermine, beaver, sable, bear, etc., are sold or bartered in exchange for food, clothing, guns and ammunition.

The Nelson, like all the rivers of the Hudson Bay area, has very many rapids. The divides between the rivers are low, and Indian trappers have no difficulty in making their way

about the country by means of the rivers, carrying their light canoes on their backs across a portage or divide, or when falls or rapids cannot be passed. In winter, when the rivers and lakes are frozen over, the trapper can move at a rapid rate on snow-shoes.

The ancient rocks of the Canadian Shield are Canada's richest treasure-house of useful and precious metals. Gold and silver; nickel, cobalt and copper; iron, zinc and lead are all found there, especially in *Ontario* which is easily first among the provinces of Canada in mineral wealth. *Ontario's* most famous gold-mines are on the *Porcupine* gold-fields. She has whole ranges of hills made chiefly of rich iron-ore; she has the biggest nickel mines in the world near *Sudbury*, while *Cobalt* is famous for both silver and cobalt. Up to the present only a small part of *Ontario's* immense treasure has been worked.

The Hudson Bay railway, a branch of the National system, runs from Winnipeg to Churchill, giving the wheat lands access to Hudson Bay. During the very short time that Hudson Bay is ice free this outlet for Canadian wheat is valuable, as it offers the shortest route between the prairies and the British Isles.

The Hudson Bay Region has very few people compared with its great size. This is accounted for by the severity of the climate, especially in the northern parts, and the fact that neither tundra nor coniferous forests support large numbers of people. Three points concerning the future are worth drawing attention to. Hudson Bay is believed to be very rich in fish, a source of wealth that may be regarded as a great reserve for future use. The second point concerns the barrens. It is not improbable that this area can be developed for raising caribou and reindeer on a very large scale. And why should not reindeer meat become an important food commodity? The third point is the enormous amount of water power waiting to be harnessed to the service of man.

EXERCISES

1. Draw a bold sketch-map of the Hudson Bay Region, shading in some distinctive way tundra, forests, hard rock, soft rock. The chief lakes, rivers and trading stations must be marked; also the chief mining centres.
2. What are the advantages and disadvantages of Churchill as a port for the wheat lands of Canada?

CHAPTER XII

THE CENTRAL PLAINS

THE Central Plains include the whole of the land from Hudson Bay and the Great Lakes in the east to the Rockies in the west. Examine the physical map of Canada in your atlas. You will see that the central plains have a long gradual slope northwards. They also rise as the Rockies are approached, three distinct prairie levels or terraces being traced. The Red River area is nearly 800 feet above sea level. West of this are two terraces of an average elevation of 1,600 feet and 3,000 feet respectively. Winnipeg is 760 feet, Calgary 3,400 feet above sea level, and since they are about 750 miles apart, the average ascent between those points is about $3\frac{1}{2}$ feet per mile.

Its northern area is drained by the Mackenzie and other rivers, such as the Peace and Athabasca. The Arctic coastlands are barren lands, whilst further south are pine forests stretching southwards into the northern parts of Manitoba, Saskatchewan and Alberta. The only trade of importance is that in furs, the splendid water-ways of the Mackenzie being the chief routes of the trappers. Flowing as it does into an ocean which is ice-blocked for the greater part of the year, the Mackenzie is of very little commercial importance.

The southern area of the central plains is drained by the Saskatchewan, Assiniboine and Red rivers into Lake Winnipeg, and includes the southern parts of Alberta, Saskatchewan and Manitoba.

The climate of this area is illustrated by the following figures—

Place.	Latitude.	Height in feet.	Coldest Month.	Warmest Month.	Mean Annual Rainfall.
Winnipeg . .	49° N.	760	-7° F.	66° F.	21.5"
Calgary . .	51° N.	3,400	12° F.	60° F.	14.9"
Edmonton . .	53° N.	2,160	6° F.	62° F.	13.9"

From this you will see that the winters are very cold, but less cold where the chinook winds are felt than at Winnipeg. The ground is generally frozen by November, and from then until April ploughing must be suspended. The summers are long and very warm, and it is then, especially in the early part of the season, that most of the rain falls. Indeed, the climate is typical of lowlands in the centre of land masses.

A very great change—the great Canadian development of recent years—has taken place on these plains as the following figures will show—

I.—POPULATION AND AREA UNDER CULTIVATION

	Population.		Area under Cultivation.	
	Year.	Population.	Year.	Acres.
Area represented by the present provinces of Manitoba, Saskatchewan and Alberta	1901	400,000	1908	2,500,000
	1911	1,322,729	1913	17,500,000
	1921	1,956,082	1921	38,700,000
	1931	2,353,529	1932	55,000,000

II.—PRODUCTION IN BUSHEL OF WHEAT, BARLEY AND OATS IN 1913 AND 1932

Province.	Millions of Bushels.					
	Wheat.		Barley.		Oats.	
	1913.	1934.	1913.	1934.	1913.	1934.
Manitoba . .	53.3	37.1	14.3	17.3	56.8	26.8
Saskatchewan .	121.6	114.2	10.4	12.4	14.1	64.3
Alberta . .	34.4	112.5	6.3	15.0	71.6	81.0

III.—HORSES, CATTLE, SHEEP AND PIGS IN 1913 AND 1932

Province.	Thousands of Animals.							
	Horses.		Cattle.		Sheep.		Pigs.	
	1913.	1934.	1913.	1934.	1913.	1934.	1913.	1934.
Manitoba .	301	297	457	759	54	218	248	184
Saskatchewan .	580	933	663	1,486	116	460	387	514
Alberta . .	485	691	779	1,604	178	640	351	809

In studying these and other statistics it must be borne in mind that the year 1913 was the year before the outbreak of the Great War, that even by 1934 trade and industry had not recovered from that great upheaval, and that 1934 was a depression year in both Canada and the United States. On the whole, whilst recent years have seen an increase in stock-rearing, it is on those parts of the plains where

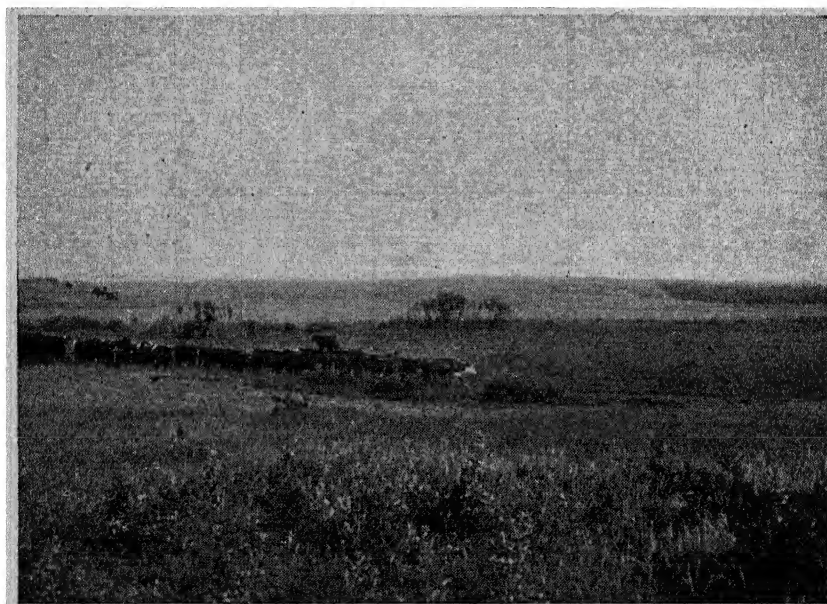


FIG. 33.—A view of the ranching country in the drier western grass-lands of Alberta.

wheat, oats, barley, etc., can be grown that the most rapid development has taken place. There has also been a great increase in mixed farming and dairying, especially in Manitoba and Saskatchewan. Even in the drier lands nearer the Rockies, farming is rapidly encroaching upon ranching in those districts where the rainfall is sufficient, where irrigation is possible, or where dry farming can be carried on.

The usual sowing time is about April, before the frost is fully out of the ground. The moisture supplied by the melting of the snows helps the seeds to germinate. Growth is assisted by the early summer rains, and the long, warm, dry days of late summer bring the grain to maturity. The soil is usually

a deep, rich mould upon which, year after year, crops can be grown without any appreciable detriment to it. Three great advantages of the prairie, from an agricultural point of view, are: (i) the soil contains no stones, (ii) there are no forests to clear, (iii) the level ground facilitates the making of roads and railways. Usually, therefore, the soil is ready at once for ploughing.

The very best lands are in the valley of the Red River and in the neighbourhood of Lakes Winnipeg and Winnipegosis. This region shows unmistakable evidence of the great ice-sheets which once covered it. The Nelson now

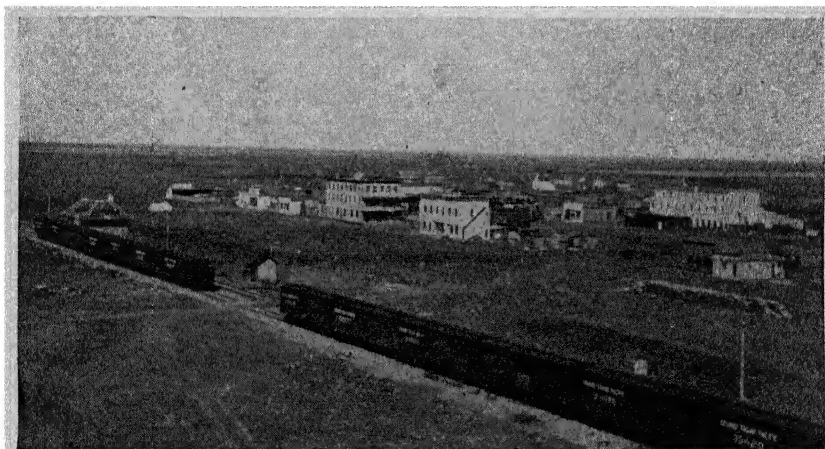


FIG. 34.—A young town on the prairie. This is a view of Scott, Sask. Note the wooden buildings, the railway line, and the general relief of the land.

drains these lakes. When the great ice-sheet was receding, but still covered the valley of the present Nelson River, a great lake was held up in front of it, and this was drained southwards into the Mississippi. Gradually the ice receded and the Nelson drained off the waters of the great lake, which is known as Lake Agassiz, into Hudson Bay, but not before rich deposits of clay and silt, over which are now thick layers of mould or loam, had been spread over its floors. Thus Lakes Winnipeg and Winnipegosis are only fragments of a former, more extensive lake, whose floor is now the rich wheat lands of the Red River valley. So flat is this area that after rains the water stands on the ground in sheets.

As we have seen, it is not difficult to construct railways on the prairies, and railways have had an important part to play in the development of the area, for it is not profitable if the farms are far removed from them. *Winnipeg* stands at the confluence of the Red and Assiniboine rivers in the midst of a region whose outstanding occupations are mixed farming and dairying. Viewed from the standpoint of Canada west of Winnipeg, that city is the "Gate to the East," whilst to eastern Canada it is the "Gate to the

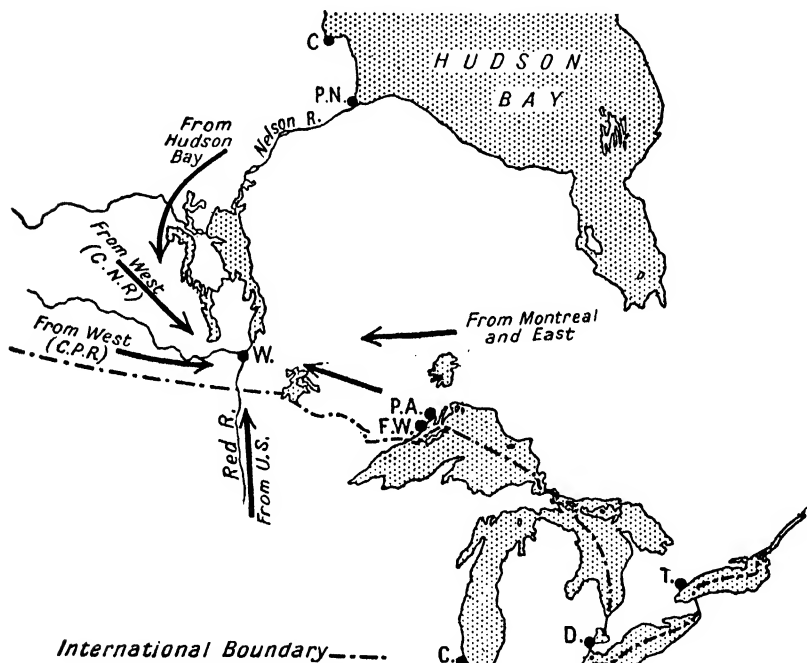


FIG. 35.—The position of Winnipeg.

West." From it railways run westwards to Calgary (Canadian Pacific) and to Edmonton (National lines). These lines are linked together by branch lines. Eastwards, Winnipeg is connected with Port Arthur, and beyond with Montreal and the East by the Canadian Pacific, while the completion of the National Trans-continental Railway will give it another outlet in Quebec. Southwards it is connected with the railways of the United States, and northwards it

is now connected with Churchill, a summer port on Hudson Bay.

It is said that at harvest-time the twenty miles of railway sidings at Winnipeg are constantly filled with trains which take the grain eastwards. The city has grown with great rapidity, for in 1870 it had less than 1,000 inhabitants, whilst to-day, including suburbs, it has over 336,000. Originally, Winnipeg was a small Hudson Bay Company fur centre; but, although it is still a very important depot for the fur trade, its chief importance is as a grain centre. Flour-milling, leather-making, and the manufacturing of farming machinery are also carried on.

Second in importance to Winnipeg in the state of Manitoba is *Brandon*, an important agricultural centre on the main line of the Canadian Pacific Railway.

Saskatchewan is higher and more undulating than Manitoba, and produces far more wheat and oats than that province. (See page 83.) Stock-rearing is also more important than in Manitoba. The most important town is the capital, *Regina*, on the Canadian Pacific main line. *Saskatoon*, on the National Trans-continental line, and *Prince Albert*, reached by a northern extension of that line, are rapidly rising agricultural centres. Its proximity to the forest belt has also made Prince Albert a lumber and trapping centre.

Alberta is higher than Saskatchewan, so that its rivers have cut deep trenches. Being to the lee of the Rockies the chinook winds have an important effect upon the climate. The winters are so mild in the south of the province that wheat sown in late autumn is grown, although wheat sown in spring is six times as important. Alberta has always been noted for its stock-rearing, for the warm, dry winds turn the grass into natural hay, making it possible for the animals to be fed out of doors all the year round. Very large quantities of wheat, oats and barley are now grown, and agricultural occupations and mixed farming rival pastoral pursuits. There is always a great demand for horses for work on the farms, and all three of the prairie provinces are engaged in meeting that demand, Alberta leading the way.

The capital of the province is *Edmonton*, which owes its original importance to a portage between the North Sas-

CHAPTER XIII

THE WESTERN HIGHLANDS (INCLUDING ALASKA)

THE general structure of this area has been described in Chapter II. It is politically divided into Alaska, Yukon Territory, and British Columbia.

THE BASIN OF THE YUKON

Alaska and Yukon consist mainly of the Plateau basin of the Yukon river. The Yukon, which is over 2,000 miles in length, runs through the centre of the region, and has at its mouth a great delta in Bering Strait. It is navigable from June to October for boats of shallow draught, and in winter time, when frozen, it makes a good sledge route into the interior. The west coast mountains contain the highest peaks in the continent, Mount McKinley being 20,464 feet; and owing to the high latitudes there are innumerable glaciers, very many of which reach down to the sea.

When in 1867 the United States bought Alaska for about one and a half million pounds, there were many complaints that a worthless country had been obtained. During the year 1934 the United States sent goods to Alaska worth 30,000,000 dollars, and received from Alaska 45,000,000 dollars worth of exports! Alaska is very rich in minerals, fisheries, forests and animals (reindeer and fur-bearing).

The fisheries are extremely rich, especially for salmon. In 1934 over 22,000 men were employed in canning salmon. Whaling and sealing also employ many men. The Pribilof Islands in Bering Sea are the world's chief centre for fur seals. Another important branch of the fur trade is fur farming. In 1934 there were 275 fur farms stocked with blue fox alone.

There are extensive forests, and lumbering is increasing in importance; but the chief wealth consists in the

rich deposits of gold, silver, copper and other minerals. The most important mining area is on the Alaskan and Yukon boundary. In 1897 gold was found in the gravel of tributaries of the Klondike, a tributary of the Yukon, and the gold rush which took place was one of the most remarkable events of recent years. Very many returned without the fortunes they went to seek, some made fortunes, and many remained—the pioneers in a country where life will always be hard and exacting.

The most important mining towns are: *Dawson City*, a Canadian town, situated at the junction of the Klondike and the Yukon, and *Nome* on Bering Strait. The best way of reaching Dawson City is by a railway from Skagway, a small port in United States territory. The line is carried over the White Pass to the head of the navigation on the Lewes, one of the headstreams of the Yukon. From this point river steamers run to Dawson City.

In 1891 sixteen reindeer were introduced into Alaska from across the Bering Strait. There have been importations since, but the number at present exceeds 700,000 (over two-thirds owned by Eskimos), so that reindeer rearing is a thriving industry. Alaska and Yukon are at present very sparsely peopled. In the former, in 1930, there were about 28,000 whites and 30,000 coloured people, the latter being Eskimos and Indians, whilst Yukon has a population of 4,230. It is estimated that about 20,000 men employed in mines, canneries and construction work, spend a few months each year in Alaska, and these are not included in the figures just mentioned.

BRITISH COLUMBIA

The islands of the sunken coast range, the drowned plain between the islands and the Cascades, the great plateau between the Cascades and the Rockies, crossed itself by many ranges, are all well marked. (See Figs. 36 and 38.) The coastal features very much resemble Norway, although if you compare the latitudes of the two countries, you will see that Norway is very much farther north, so that British Columbia has a great advantage in this respect. The climate varies with the altitude, the most equable parts being naturally the southern coast-lands where the range of temperature is not great, whilst the plateau has a more extreme climate. The

rainfall is heavy on the coast range, for the prevailing winds are the westerlies; but in the valleys behind the mountains the rain is considerably less, although on meeting ranges like

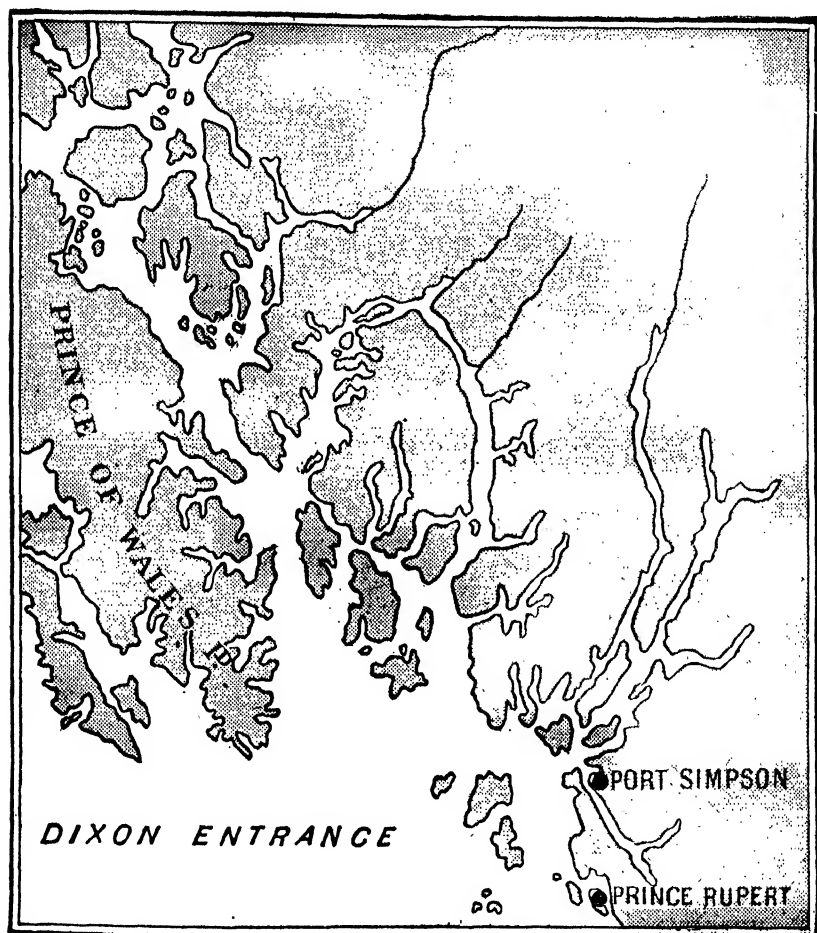


FIG. 36.—A map of part of the sunken north-west coast. Observe its indented character. Prince of Wales Island is a portion of the old coast range. What islands are separated from Prince of Wales Island by Dixon Sound? Find out from your atlas.

the Selkirks, the winds once more ascend and precipitation takes place. (See Figs. 20 and 21.) Naturally, the mountains more to the east have less rain than those nearer the west,

and this accounts for the greater rainfall and snowfall on the Selkirks than on the Rockies. The Selkirks are noted for their magnificent glaciers. Thus, as regards rainfall, there is a series of wet and dry belts.

Rivers.—The north-east part of the province is drained to the Mackenzie by the Peace and Lizard rivers, but the drainage is mainly to the Pacific, by such rivers as the Skeena, Fraser and Columbia. Notice carefully the courses of the Fraser and Columbia. Each has its source in the trough between the Cariboo and Selkirk mountains on the one hand and the Rockies on the other. (See Fig. 38.) Each flows northward, the Columbia bending round the north of the Selkirks and the Fraser round the end of the Cariboo mountains. Turning southwards, each now runs in a valley parallel to its upper course. Breaking through the coast-ranges by magnificent gorges, they finally enter the Pacific. Now notice the Kootenay, a tributary of the Columbia, and you will see that instead of flowing northwards, it first runs southwards along the same trough as the Upper Columbia, and after bending round the southern end of the Selkirks, and flowing a little northwards, joins the main stream. Where the rivers run along the “graining” of the country, they are called “longitudinal” streams, but where they cut through the separating mountain ranges they are “transverse,” because there they are flowing *across* the “graining” of the country. These types of valleys have one very marked difference in appearance. The transverse valley naturally tends to be narrow and gorge-like, whilst the longitudinal valley is usually broad and open.

Natural Wealth.—Let us now consider the natural wealth of the province. From the formation of the coast-line we should expect (1) *fishing*, and we have learned that the province contains forested areas, so that we shall have (2) *lumbering*. From the fact that British Columbia is mountainous and has many rivers at work, deepening their valleys, we should expect any minerals the rocks contained to be exposed or more easily obtained than in an area where the rocks had not been disturbed. The Rockies are exceedingly rich in minerals, so that (3) *mining* is an important source of wealth. (4) *Agriculture* we should expect to be carried on only on the lowlands of the river valleys such as the Fraser, but this

industry is rapidly becoming one of the province's chief assets, for it has rich arable and pasture lands. The best arable lands are the lower Fraser valley, and the lowlands of Vancouver Island and the mainland opposite that island. Pasture lands are found in the intermont plateaus and valleys. In the drier regions, cultivated areas are being extended by means of careful irrigation. So we see that British Columbia's wealth consists chiefly in its fisheries, its forests, its minerals and its agriculture.

1. *Fishing*.—In 1934 the value of the British Columbian catch was 15 million dollars, 44 per cent. of the total for the country as a whole. The greater part was accounted for by salmon alone. Halibut and herring fishing is, however, rapidly developing, and will be of more importance as time goes on. Salmon live in the ocean, but come to the rivers every year in order to spawn or to lay their eggs. They manage to overcome many obstacles in pushing their way inland, even leaping many feet into the air in order to reach the stretches of river above the waterfalls. Whilst travelling up the river, they are caught by various means, such as nets spread across the river, or by dip nets as they leap in order to ascend a small waterfall. The canning trade is very important and employs a large number of people, especially at New Westminster near the mouth of the Fraser.

2. *Lumbering* is exceedingly important in British Columbia, as is shown by the fact that the province produces over one-half of the total output of Canadian lumber. The pulp industry is also very important. Canada's finest trees are found in British Columbia (see page 47) and her timber finds a ready market not only in the timberless prairies of Canada and the United States, but in all parts of the world.

3. *Mining*.—In this industry British Columbia ranks second among the Canadian provinces. Coal is extensively mined in Vancouver Island and in the region of Crow's Nest Pass. The former supplies the Western Pacific towns and the British Pacific Naval Squadron, whose headquarters are at Esquimalt in the south of Vancouver Island. The coal-mines of the Crow's Nest Pass region supply the Canadian Pacific Railway and the gold, silver, copper and lead mining area in the south-east of the province. The chief centre

of this busy mining district is *Rossland*, a town near the Columbia and almost on the U.S.A. frontier. You will, therefore, see that the chief mining areas are in the southern portion of the province, but this must not be taken to indicate that minerals are not found elsewhere, for there are in many parts mineral deposits which only await the construction of railways, without which they cannot be developed.

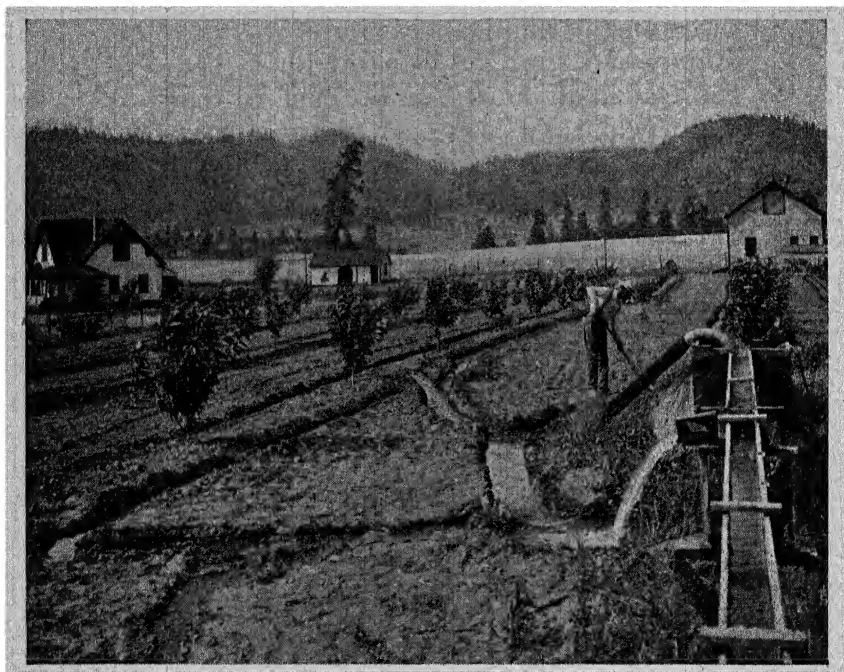


FIG. 37.—Fruit-growing by means of irrigation at Kelowna, British Columbia.

4. *Agriculture*.—Little need be added to what has been already learned. The greatest development of recent years has been in fruit-growing, and British Columbia is now Canada's chief fruit-producing province. Apples, plums, pears and cherries are the chief fruits and the world-famed Okanagan valley is the best known area engaged in the industry. 1,619,000 barrels of apples were exported in 1934, and in the same year the total value of the state's fruit exports was 6,200,000 dollars. Ontario came second with fruit exports valued at 4,180,000 dollars.

Routes.—Railways enter the province from the East by the Yellowhead, Kicking Horse and Crow's Nest Passes. The Canadian National Railway, after leaving Edmonton,



FIG. 38.—Routes across the Canadian Rockies.

crosses the Yellowhead Pass, and follows the valley of the Fraser River to where that river turns southwards, from which point it follows one of the Fraser's tributaries. From thence it strikes the valley of the Skeena River, which it

follows to its terminus at Prince Rupert. A second terminus is at Vancouver, which is reached by a section of the National system making use of the valleys of the Canoe, Thompson and lower Fraser rivers.

The oldest railway is the Canadian Pacific, whose main line first crosses the Kicking Horse Pass to the Upper

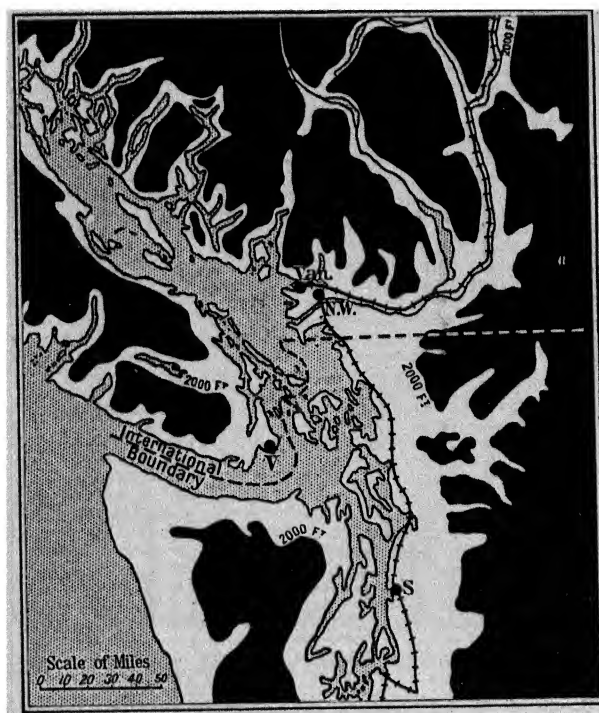


FIG. 39.—Map to show the positions of Vancouver, New Westminster, Victoria and Seattle.

Columbia, and then the Selkirks, passing magnificent mountain scenery. Reaching the South Thompson, the railway follows that river to its confluence with the Fraser, along which it runs to Vancouver. A branch of the Canadian Pacific crosses the Rockies at the Crow's Nest Pass and taps the rich mining districts of the Upper Kootenay and Rossland.

THE CHIEF TOWNS

The capital of the province is *Victoria*, on Vancouver Island. It is an important port, and has a splendid harbour. It has many lumber mills, and is the head-quarters of the Canadian fur-sealing fleet. Near to it is *Esquimault*, the naval port for the Pacific. Coal and iron are found in the vicinity.

Vancouver, the largest city in British Columbia, has grown very rapidly owing to the great advantages which it possesses. In 1886 the site of the town was forest land—the public park still contains very many Douglas firs—whilst in 1931 it had a population of over 344,000, more than five times that of Victoria. The site was selected on account of its magnificent deep-water harbour, one of the finest in the world. To this harbour, as we have already seen, come the two great trans-continental railways, the Canadian National and the Canadian Pacific. It is also the natural outlet of the agricultural lands of the lower valley of the Fraser. From Vancouver, steamship lines, some owned by the Canadian Railways, run to the western ports of America as well as to Australia and the ports of China, Japan and India.

New Westminster, one of the oldest towns in British Columbia, is situated near the mouth of the Fraser. It has important fruit-canning works, and is the chief centre of the fruit trade.

EXERCISES

1. Describe the route taken by the Canadian Pacific Railway from Calgary to Vancouver, and show how it is related to the physical features.
2. What industry in British Columbia has been developed by careful irrigation? Examine Fig. 37. Describe the means by which the fields are being watered.
3. The chief exports of British Columbia are minerals, fish and fruit. Are these what you would expect to be the chief articles of trade? Why?
4. Describe the coast-line of British Columbia. What do you know of its formation? Mention similar coast-lines in America and Europe.
5. Give the position and importance of Victoria (B. C.), Vancouver, Rossland, Dawson City and Prince Rupert. Draw sketch maps to bring out clearly the points you mention.

THE CHIEF CANADIAN RAILWAY COMMUNICATIONS

IN going over the different regions of Canada the chief railway communications have been referred to in each region. Now let us link all these together, and at the same time trace them on an atlas map. The ownership is very simple, for, since the Grand Trunk Pacific, Grand Trunk, Canadian Northern and Intercolonial systems have become State controlled, there are now only the National Railways and the Canadian Pacific. These magnificent railway systems bind together the widely separated western and eastern provinces, and make it possible for the products of field, forest and mine to reach the ports.

The Canadian Pacific Railway is the oldest trans-continental line, its construction being part of the bargain under which British Columbia joined the Dominion. It connects St. John and Halifax with Montreal, and from Montreal passes westwards through Ottawa and along the northern shores of the Great Lakes to Port Arthur and Winnipeg. From Winnipeg it continues its westward direction via Regina, Calgary, the Kicking Horse Pass, and the valley of the Fraser to Vancouver, a city which owed its origin to the construction of the railway. Many branch lines connect the main line with the National railways to the north and the U.S.A. railways to the south, whilst C.P.R. steamships carry passengers and goods from Vancouver to Australia, China, and Japan.

The Canadian National Railways.—The National trans-continental line runs from Halifax, Montreal and Quebec, via Winnipeg, Saskatoon, Edmonton, and the Yellowhead Pass to either Vancouver or Prince Rupert. The Hudson Bay branch line from Winnipeg to Churchill gives the Central Plains an outlet via Hudson Bay, but unfortunately this can only be used for a few months in summer.

The greatest railway development has taken place in the central plains where agricultural prosperity and railway construction go hand in hand, for the cost of transport from farm to railway may make it impossible, without railways

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close at hand, to compete with others more favourably situated. The triangle "Edmonton—Calgary—Winnipeg" is a network of lines.

It is interesting to note the time taken to cross Canada by one of the Trans-continental lines. This is shown by the following extract from the time-table of the National System:—

HALIFAX (N.S.) TO PRINCE RUPERT (B.C.)

Train leaves Halifax	.	.	.	8.10 a.m. Monday.
" arrives at Montreal	.	.	.	5.0 p.m. Tuesday.
" " " Winnipeg	.	.	.	8.45 p.m. Thursday.
" " " Saskatoon	.	.	.	11.25 a.m. Friday.
" " " Edmonton	.	.	.	11.25 p.m. Friday.
" " " Prince Rupert	.	.	.	7.45 p.m. Sunday.

Compare this with the following times for a Canadian Pacific train from Montreal to Vancouver:—

MONTREAL TO VANCOUVER

Train leaves Montreal	.	.	.	10.15 p.m. Tuesday.
" arrives at Ottawa	.	.	.	1.15 a.m. Wednesday.
" " " Fort William	.	.	.	9.10 a.m. Thursday.
" " " Winnipeg	.	.	.	8.45 p.m. Thursday.
" " " Regina	.	.	.	9.15 a.m. Friday.
" " " Calgary	.	.	.	4.0 a.m. Saturday.
" " " Kamloops	.	.	.	9.40 p.m. Saturday.
" " " Vancouver	.	.	.	8.0 a.m. Sunday.

The trains are equipped or built up in different ways, *i.e.* of colonist, observation, sleeper or dining cars, and the intending traveller can choose a train whose equipment meets his desires or perhaps his purse. Meals can be purchased on the train or obtained at the larger stations *en route*, or they can be cooked on the train by the traveller, for gas cookers are provided.

EXERCISE

Describe a journey by one of the trains whose time-table is given above. In which parts of the journey would you prefer to travel in the observation car? Is there any part of the journey you would be disappointed not to see owing to the time at which you would pass it? At what time of the year would you prefer to make this journey? How does the time taken compare with that of a fast liner plying between Liverpool and Halifax, or Boston? In which part of the line would the construction per mile be most costly? In which the cheapest? (See exercise 5 on page 160. This may be left until later, but you must note at this stage that the clock times are "adjusted" owing to the great stretch in longitude.)

CHAPTER XV

THE GROWTH OF CANADA: ITS POPULATION AND TRADE

I. BRIEF HISTORICAL OUTLINE OF THE GROWTH OF CANADA

WE have learned that the first Europeans to visit Canada, were the Norse sailors, who founded colonies in the east long before the eventful voyage of Columbus. Newfoundland was discovered in 1497 by Cabot, but settlements were not made until the end of the next century. In the meantime, French explorers were pushing their way into the interior by means of the great St. Lawrence waterway. Jacques Cartier made three voyages of discovery, on the second of which he reached the island of Montreal, whilst Champlain at the beginning of the seventeenth century founded Quebec, and explored the various rivers leading from the St. Lawrence into the interior. These men led the way for a French settlement of the basin of the St. Lawrence. First came the traders and trappers, who gradually pushed their way first to the great lakes, then to the valley of the Ohio, and finally to the mouth of the Mississippi, although their hold on the latter portion was very slight. This expansion was not difficult, for there were no serious physical obstacles to overcome. The vast size of the area, however, caused the colonists to be very scattered, whilst the English settlements on the east coast were more compact, owing to the limited area of the eastern plains of the Atlantic seaboard. This was especially true of the English settlements in the New England States, where men of the same Puritan faith were strongly banded together. Thus, when the conquest of Canada was undertaken, New France, as the French colony in the St. Lawrence basin was called, fell into English hands when the stronghold of Quebec was captured, and a large number of French-speaking people be-

came British subjects. Even to-day about four-fifths of the people of the province of Quebec speak French and are Catholics. The conquest of Canada was entered upon by England in defence of the American colonists, for eventually the latter crossed the Appalachian barrier and reached the great central plains. Naturally conflicts took place not only in this area, but along the St. Lawrence, and the French took steps to keep the English on the east coast plains, hoping at some future time to drive them out of the continent altogether. In 1756 the struggle between the English and French was begun. It is not necessary here to go into the details of all that happened during the campaign, and how it was finally brought to an end in 1759, by the victory of General Wolfe at Quebec. The fall of Quebec ended the American part of the Seven Years' War, and the Treaty of Paris, which was signed in 1763, transferred Canada to England, with the exception of two small islands in the Gulf of St. Lawrence.

The American War of Independence took place only sixteen years after the capture of Quebec, and during that time an attack on that city was frustrated. At the close of the war those American colonists who had remained loyal to England were stripped of all lands and possessions. About 30,000 of them were shipped to Nova Scotia, whilst many settled in what is now the province of Ontario, at the town of Kingston. In this way the valley of the St. Lawrence became inhabited by the French in its lower half, and by the English in its upper half. These areas became known as Upper and Lower Canada, and to-day correspond roughly to the provinces of Quebec and Ontario.

At the beginning of the nineteenth century there were settlements in Upper and Lower Canada, the maritime provinces of Prince Edward Island, Nova Scotia and New Brunswick, and in Newfoundland. The west and north-west were almost unknown. In 1670 the Hudson Bay Company was founded. It acquired rights over the whole of the area draining into Hudson Bay, and later over lands farther west. The fur traders resented any interference or attempts at settlement, and until 1869, when the Government took over the Company's rights, very little had been done in the way of settlement or development west of Upper Canada, excepting in British Columbia, where the Californian gold rush of 1849 was succeeded

by one to that province in 1857. Before this time there had been numerous Hudson Bay Company trapping stations in the province.

Thus, in 1867, when the Dominion of Canada was formed, British Columbia was entirely shut off from the east, for there was no road across the Prairies and the Rockies. British Columbia joined the Dominion on the understanding that a great railway should be constructed across the continent. The only province to refuse to enter the Dominion was Newfoundland, which still stands out. The development that followed the construction of the Canadian Pacific Railway, completed in November 1885, was wonderful, and put an end to the belief that west of the Great Lakes was fit only for hunting and trapping.

II. MODERN CANADA AND THE PRESENT DISTRIBUTION OF THE POPULATION

Modern Canada is made up of nine provinces and two territories (Yukon and North-west), the latter being administered as one. Your atlas will show what the boundaries of these provinces are. You will see that British Columbia is the Pacific Province; Alberta, Saskatchewan and Manitoba are the Prairie Provinces; Ontario and Quebec are the Provinces of the St. Lawrence Basin; Prince Edward Island, Nova Scotia and New Brunswick are the Eastern or Maritime Provinces. Northern Canada is made up of the Yukon and North-west Territories, whilst Newfoundland and Labrador are under separate government.

Each province has responsible government of its own, and looks after all matters which are of a provincial nature. The Dominion Government meets at Ottawa, and is responsible for all matters relating to immigration and the development of the unoccupied lands of the Prairie Provinces. It also controls all matters which affect the Dominion as a whole and its relation with other countries. There is a House of Commons and the Senate, the former being elected by the people, and the latter by the Government. Representing the King is a Governor-General, whilst at the head of each provincial government is a Lieutenant-Governor, who is appointed by the Governor-in-Council.

III. POPULATION

The following tables are quoted from the *Statesman's Year Book* and *Canada in 1931*. The latter is one of the excellent publications of the Canadian Government.

INCREASE IN THE POPULATION OF CANADA
FROM 1801 TO 1931

Year of Census.	Population.	Year of Census.	Population.
1801	240,000	1891	4,833,239
1825	581,920	1901	5,371,315
1851	1,842,265	1911	7,206,643
1861	3,090,561	1921	8,787,998
1871	3,635,024	1931	10,374,196
1881	4,324,810		

Notice the great increase in the years 1901-11. The Great War interfered with the years 1911-21.

AREA AND POPULATION OF EACH PROVINCE
FROM 1901 TO 1931

Population.	Total area in square miles.	Population 1901.	Population 1911.	Population 1921.	Population 1931.
Prince Edward Is.	2,184	103,259	93,728	88,536	88,038
Nova Scotia .	21,428	459,574	492,338	524,579	512,846
New Brunswick .	27,985	331,120	351,889	388,092	408,219
Quebec . .	706,834	1,648,898	2,003,232	2,349,067	2,874,255
Ontario . .	407,262	2,182,947	2,523,274	2,922,000	3,431,683
Manitoba . .	251,832	255,211	455,614	613,008	700,139
British Columbia	355,855	178,657	392,480	523,369	694,263
Alberta . .	255,285	72,841	374,663	581,998	731,605
Saskatchewan .	251,700	91,460	492,432	757,510	921,785
Yukon . .	207,076	27,219	8,512	4,157	4,230
North-west Terri- tories . .	1,309,682	20,129	18,481	7,988	7,133

First it should be noted that the boundaries of several of the provinces were changed during the years 1901-11. It will be seen at once that the majority of the people are still in older Canada, that is, Quebec and Ontario; that the great increase has been in Manitoba, Saskatchewan and Alberta, but that there is still plenty of room there for newcomers.

Note the decrease in Yukon and Prince Edward Island.

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Now notice the figures giving the original national stocks of the inhabitants of Canada at the 1931 census.

POPULATION ACCORDING TO NATIONAL ORIGIN, 1931

British	5,381,071	Norwegian	93,243
French	2,927,990	Swedish	81,366
German	473,544	Austrian	48,639
Russian	313,261	Chinese	46,519
Hebrew	156,726	Finns	43,885
Dutch	148,962	Elsewhere	286,484
Polish	145,503		
Indian and Eskimo . .	128,890	Total	10,374,196
Italian	98,173		

NUMBER OF IMMIGRANT ARRIVALS IN CANADA, 1925-1933

Year.	Immigrant Arrivals from			Total.
	United Kingdom.	United States.	Other Countries.	
1926	37,030	18,778	40,256	96,064
1927	49,784	21,025	73,182	143,991
1928	50,872	25,007	75,718	151,597
1929	58,880	30,560	78,282	167,722
1930	59,603	30,727	68,479	163,288
1931	27,584	24,280	36,359	88,223
1932	7,088	14,297	4,367	25,752
1933	3,097	13,196	3,579	19,872
1934	2,260	7,740	6,163	16,163
1935	2,198	5,960	3,978	12,136

The percentage of people of British stock is not nearly so high in Canada as in Australia and New Zealand.

IV. TRADE

Finally, the trade of Canada is shown by the following figures. Notice how the statistics given above and those which follow give a clear indication of the effect of the world-wide economic depression of the last few years.

TOTAL IMPORTS AND EXPORTS

Year.	Imports (in dollars).	Exports (in dollars).
1922	747,804,000	740,241,000
1926	927,329,000	1,315,356,000
1930	1,248,273,000	1,120,258,000
1934	433,800,000	585,655,000

The next set of figures gives the *chief imports and exports* for the year ended 30th March, 1930. This year is more typical than any of the later "depression" years and on that account is retained.

Imports.		Exports.	
Commodity.	Value in dollars.	Commodity	Value in dollars.
Machinery . . .	69,117,528	Wheat . . .	215,753,475
Coal . . .	56,812,418	Printing paper .	145,401,482
Crude petroleum .	50,951,202	Planks and boards	49,446,887
Spirits and wines .	44,484,526	Wheat flour . .	45,457,195
Electrical apparatus .	37,611,263	Wood pulp . . .	44,913,995
Automobile parts .	35,746,929	Copper . . .	37,735,413
Automobiles . . .	34,464,666	Automobiles . .	35,307,645
Steel plates and sheets	31,755,866	Fish . . .	34,767,739
Farm implements .	30,075,453	Gold . . .	34,375,003

The last set of figures shows the countries traded with.

Year.	Trade (in thousands of dollars) with—			
	United Kingdom.	Other parts of British Empire.	United States.	Other Foreign Countries.
<i>Imports</i>				
1914 . . .	132,070	22,456	396,302	68,365
1922 . . .	117,135	31,973	515,958	82,736
1930 . . .	189,179	63,523	847,450	148,119
1933 . . .	86,466	33,918	232,548	53,451
<i>Exports</i>				
1914 . . .	215,253	23,388	163,372	29,573
1922 . . .	299,361	46,473	292,588	101,816
1930 . . .	281,838	97,904	514,957	225,558
1933 . . .	184,361	37,737	143,160	108,520

Perhaps you are surprised to discover that Canada does more trade with the United States than with the mother country. But you must not forget that Canada and the United States are neighbours and geographically one area. An ocean divides Canada and Britain, and fashions and methods differ. Moreover, the United States is able to supply most of the manufactured articles which can be obtained

from the United Kingdom, and in spite of a high duty charged on all goods entering Canada, and of the fact that goods from the mother country have this duty reduced by about one-third, the proximity of the United States is so important a factor that she enjoys a much larger share of Canadian trade than the mother country herself. Perhaps the trade between Britain and Canada will increase in the future as a result of the Empire Economic Conference held at Ottawa in 1932.

The economic development of Canada during recent years has been most remarkable. It is natural that she should be a great producer of foodstuffs and raw materials, and also that her vast resources in agriculture, fisheries, forests, water-power, etc., should lead to such industries as flour-milling, meat-packing, fish-packing, butter-making, cheese-making, pulp and paper manufacturing, tanning and leather. But modern Canada has taken her place among the manufacturing countries of the world. She imports raw materials and manufactures cotton and woollen goods, rubber goods, sugar, motor-cars, and many other articles. Every year sees Canada less dependent upon other countries for these and other articles. She is already an important exporter of manufactured goods.

EXERCISES

1. "Canada leads the world in the production of nickel, cobalt and asbestos; she is the second biggest producer of gold in the British Empire, and has rich silver, copper, lead and zinc mines." Make a map of Canada to show the distribution of these minerals, and add coal and iron.
2. "Quebec and Ontario have no coal-mines, but they have 60 per cent. of the population and 80 per cent. of the manufactures of Canada." Comment upon this statement and state what power is used in the manufacturing industries.
3. Construct a graph, showing the increase in the population of Canada from 1801 to 1931. Notice the intervals between the years 1801 and 1851.
4. Draw a circle of about $2\frac{1}{2}$ inches radius. Divide it into sectors which show proportionally the number of people in Canada who are of Canadian, British, Austrian, Russian, South European, etc., birth. Use the figures given.
5. Consult a reference book which gives trade statistics and see if the statements made in the last paragraph of this chapter are proved by an examination of the character of the chief imports and exports of Canada.

CHAPTER XVI

THE UNITED STATES

NEW ENGLAND

IN area the United States is rather smaller than British North America, but it has a population nearly thirteen times as large. Its area is 3,568,000 square miles, or about as large as Europe without Spain.

As in Canada, the three great physical divisions—the Western Highlands, the Central Plains and the Eastern Highlands—are well marked, although we must notice that the Western Highlands are much broader than in Canada, whilst there are broad margins of lowlands between the Eastern Highlands and the Atlantic Ocean. You will remember that we have divided the Appalachian system into a northern and a southern portion (see p. 14), and the Western Highlands into the Snake Plateau, the Great Basin, the California Valley and the Colorado Plateau (see Fig. 5). The Central Plains fall naturally into the Great Lakes basin and the basin of the Mississippi. We shall take these areas as units for our study of the country.

THE NORTHERN APPALACHIANS: THE NEW ENGLAND STATES

This region is that part of the Appalachian system north-east of the river Hudson. The United States portion is the New England states, although your atlas map which gives state boundaries will show that the state of New York owns a narrow strip of land east of the Hudson.

From what has been learned about the Great Ice Age, we are already familiar with many of the chief factors of the physical features of these states. We have learned that the Northern Appalachians have sunk, and if you look at the coast-line of New England, you will see that this sinking has

made it very irregular and, in so doing, many good harbours have been formed. There are also very many lakes and waterfalls, the origin of which is described in Chapter IV. In many places, especially in the south, there are moraines, whilst much of the surface is boulder strewn. You will see from your map that the lowland is near the coast, and that the land rises towards the west and north to the Green Mountains and the White Mountains. The direction of the drainage is south or south-east, the rivers occupying wide longitudinal valleys. Notice the Merrimac and Connecticut rivers.

INDUSTRIES

When the Pilgrim Fathers settled here in the seventeenth century, these states were much more forested than they are to-day, and *lumbering* and *shipbuilding* were among the earliest industries. *Fishing*, too, was one of the first occupations, for the character of the coast and the presence of a Continental shelf would help this. In this part of North America, owing to the hardness of the rocks from which it has been derived, the glacial soil is, as a rule, difficult for agriculture on account of its stony character. Moreover, the development of the prairie lands of the central plains has made it unnecessary for these states to grow much wheat, etc., so that the *agriculture* is confined mainly to fruit-growing, and the production of milk, butter, cheese, eggs and vegetables, all of which are easily sold in the large cities.

It will be recalled that lumbering, fishing and mixed farming are the chief occupations in the Canadian maritime provinces, especially in New Brunswick. But New England has gone a stage further, for it is one of the chief *manufacturing* sections in the United States, and this in spite of the fact that most of its raw materials for manufacture have to be imported. One reason for this is the great supply of water and electric power provided by the numerous falls and rapids. But large numbers of the mills and workshops are worked by steam-engines, for the inhabitants have become so skilful in manufacturing that their trade has enormously increased. It is important to notice that in New England neither coal nor iron is found.

The chief manufactures are *cotton*, *wool*, *leather* and *iron*. Cotton is brought by water from the southern states, wool

from Ohio and the states further west, as well as from Argentina and Australia. Leather making was one of the earliest manufactures, and is aided by the great supplies of trees, especially hemlock, whose bark gives the tannic acid used in tanning. The manufacture of boots and shoes is the most important branch of the leather trade. Owing to the fact that iron is not found in New England, and that coal has to be brought from other states, the metal manufactures are, as a rule, those which require little raw material but considerable skilled labour. In this respect they may be compared with similar industries in Switzerland. Thus, articles such as jewellery, watches, clocks and firearms are manufactured. The watches made in Waltham and Waterbury are sold all over the world.

CHIEF CITIES

The largest and most important city in New England is *Boston*. It ranks ninth in size in the United States, and is second to New York in importance as a port. It has a splendid harbour, situated at a point where several drowned river valleys meet. Railway lines run from Boston to the manufacturing districts, for which it acts as a collecting centre for goods for export, and a distributing centre for the raw materials imported by sea. Besides being a port at which many steamships for foreign countries call, Boston is a great manufacturing town, especially of clothing. If you examine your atlas map (or Fig. 43) you will see that in order to reach the Mohawk Gap, mountains have to be crossed, thus making the approach to the Central Plains from Boston much more difficult than from New York, and therefore enabling the latter to outstrip Boston in importance. Nevertheless, Boston exports a considerable amount of meat and grain from the Central Plains.

Portland, in Maine, we have already heard of in connection with Montreal, for when the St. Lawrence is frozen, and Canadian trade is carried on through the winter ports, much of it passes through Portland, owing to the fact that it is the nearest ice-free port to Montreal. It is an important fishing centre. Of the manufacturing towns the chief are—

Fall River on the south coast. As will be gathered from its name, it has power derived from falls. This town is the largest

cotton manufacturing centre, and has the extra advantage of having a harbour deep enough to accommodate the ships which bring its raw materials. It also has woollen mills.

Manchester is situated near the Falls of the Merrimac, and like *Lowell*, which is on the same river, and *Providence* (R.I.) manufactures cotton goods. *New Haven* is the largest city in Connecticut, and is on Long Island Sound. The two oldest of the American Universities are in New England: *Harvard*, founded in 1636, being at Cambridge, three miles from Boston, and *Yale*, founded in 1701, at New Haven.

EXERCISES

1. Account for the greater density of the population in Massachusetts, Rhode Island and Connecticut, than in the other New England States. (See figures on p. 152.) Make a map to show the density of the population in these states.

2. Why is it that the New England States are very important for manufacturing despite the lack of the raw materials, and the coal and iron required for manufacturing?

3. Give reasons why Boston has become such a large and important city. Why has it been outstripped by New York? Of what importance is Boston to the busy cities in the vicinity? Of what importance are they to Boston? Draw a map to illustrate the position of Boston.

4. In what ways did the great ice sheet influence (i) the agriculture, (ii) the industries, of the New England States?

CHAPTER XVII

THE SOUTHERN APPALACHIANS

THIS area is south of the Hudson, and has been described on pp. 14 and 15. The Southern Appalachians have not been glaciated like the Northern Appalachians, so that the uniformity of the latter is absent, and in its place we have marked contrasts between the Alleghany plateau, the Central Valley, the Appalachian ridges, the Piedmont plateau, and the Coast Plains. The whole area has been uplifted, and thus the coastal plains from New Jersey to Mexico were formed. However, it should be noticed that a slight sinking of the land allowed the sea to drown many of the mouths of the rivers, especially those of the Delaware and the rivers flowing into Chesapeake Bay, and thus the wide openings which you will see on the map were formed.

THE FALL LINE

You will remember that the Piedmont plateau is east of the Appalachian ridges. It is an old peneplain which has been uplifted, thus causing the rivers which cross it to deepen their valleys. As this area has not been glaciated, the soil has not been washed away. It is very fertile and forms splendid agricultural land, especially important where the climate is suitable for the growth of cotton and tobacco. When the rivers leave this belt of old hard rock, they meet the newer softer rocks of the uplifted coastal plains, and this difference in the hardness of the rocks has caused the rivers to make waterfalls. You will not be surprised to hear that many of the most important cities of the country are on this Fall Line, for power for manufacturing can be obtained there. See Fig. 40, and notice the Fall Line towns and the rivers on which they stand.

THE COASTAL PLAINS

These plains vary from 30 to about 100 miles in width. They have been formed by successive uplifting and sinking. At one time uplift would take place, and part of the

sea bed would become dry land. At another time sinking would take place, but not all of the previously uplifted land would be submerged. This must have taken place many times, and thus the new land which has been added is in great



FIG. 40.—The Fall Line.

belts roughly parallel with the seashore. This is important, for these belts are not always of the same material, some being of sand and some of clay; so that owing to differences of soil there are differences of vegetation and of occupation. The sandy belts are usually pine forested, and lumbering is important, whilst the more fertile areas are cultivated.

If you visited this region and compared the rivers below and above the Fall Line, you would be struck by the great difference. On the older and harder Piedmont plateau, they are small and rapid, and often not navigable even for a small canoe; but on their plain courses they broaden, flow slowly, and generally have broad estuaries navigable for large ships, especially in the case of the sunken Chesapeake and Delaware Bays. The lower courses of these rivers are tidal, and thus towns grow up at the tidal limit, and if this should be at the Fall Line, as in the case of Philadelphia on the fall line of the Schuylkill and at the head of the tidal water of the Delaware, the town has a double advantage of site. Baltimore, Richmond and Washington enjoy similar advantages.

The last belt to be uplifted was the coastal one, and this is usually marshy, but where the climate is suitable it can be used for the production of rice, which forms such an important part of the food of the large negro population of the south-eastern states.

The coast is fringed by many islands enclosing lagoons between them and the coast. Notice Cape Hatteras, which has been formed by the joining of two of these bars. These are found not only opposite the mouths of the rivers, in such a position as to make the harbours poorer, but the waves and tides have built them where the waves are broken by the shallow waters off the coast. The lagoons in the course of time will be filled by blown sand, vegetation, etc., and thus the islands will be attached to the mainland. The islands off the coast of Georgia and South Carolina are noted for the very best of all cotton—sea islands cotton. As the sea breezes temper the summer heat, they are also holiday centres for the white population of the south-eastern states.

ROUTES ACROSS THE SOUTHERN APPALACHIANS

The parallel ridges and valleys of the Appalachians are very well marked, and formed serious barriers to communication from east to west until railways were constructed following rivers which have cut transverse gaps in the ridges. The best routes are those which follow the Hudson, Delaware, Susque-

hanna and Potomac rivers, and of these by far the easiest is the Hudson route.

New York and the Hudson-Mohawk Gap.—Fig. 41 is a map of the environs of New York, and shows that the city is built mainly on islands at the sunken mouth of the Hudson,

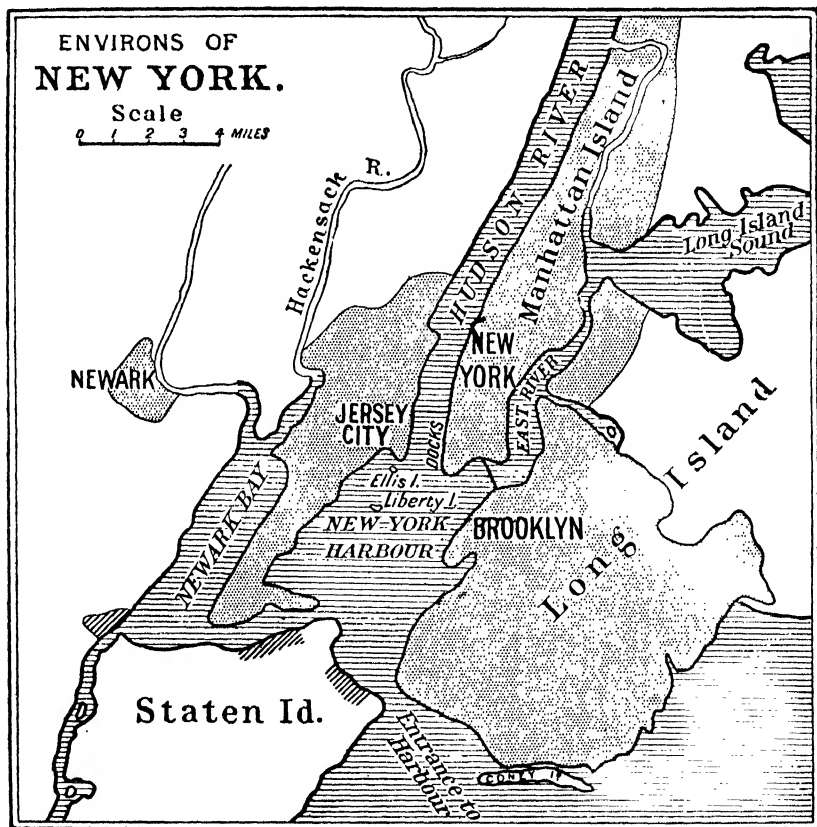


FIG. 41.—The environs of New York City. The shaded portions are densely populated.

thus giving miles and miles of river frontage suitable for docks and landing stages. The old bed of the Hudson can be traced right to the edge of the Continental Shelf, and the submerging of the lower parts of the river has given to New York a protected harbour behind Long Island. The first settlement was made by the Dutch, who called it New

Amsterdam, a name which was afterwards changed to New York on its capture by the English in the reign of Charles II. What has made modern New York the second largest city in the world, and far away the most important port in America, is the unrivalled combination of a splendid harbour and easy

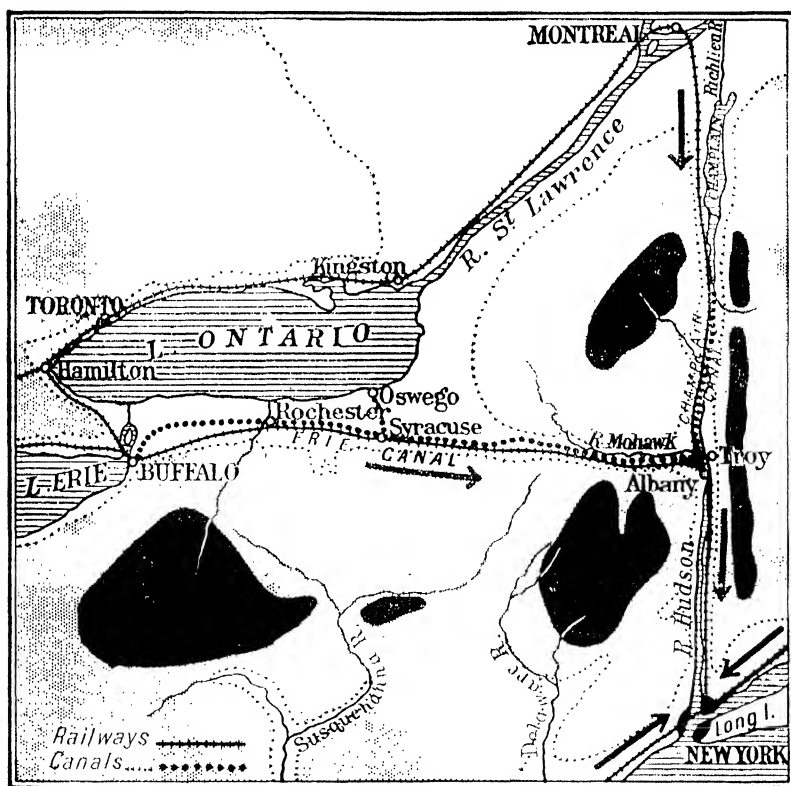


FIG. 42.—The Hudson-Mohawk Gap. This figure illustrates the importance of the position of New York.

lines of communication with the interior. Look at Fig. 42: you will see that following the lines of the Hudson-Richelieu and the Hudson-Mohawk are low routes right through the Appalachian barrier. Notice the position of Albany, which is at the tidal head of the Hudson. From here canals to Buffalo (Erie Canal) and to Lake Champlain (Champlain

Canal) give water communication between New York and the Great Lakes and the St. Lawrence. The Erie Canal was built in 1825, and in consequence of increased modern requirements has been enlarged. You will expect these routes to be followed by railways, and so they are—the

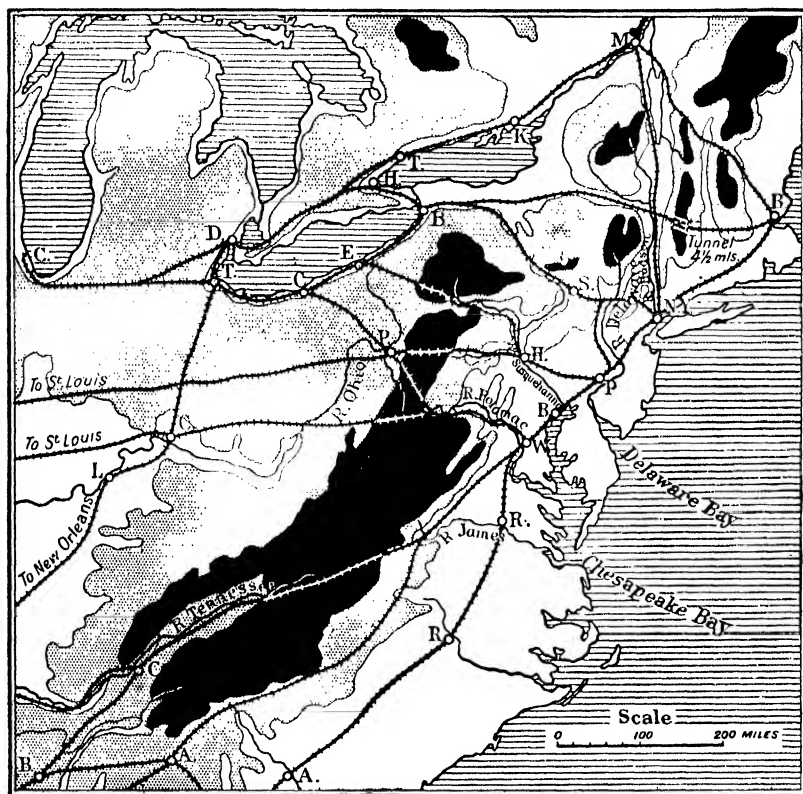


FIG. 43.—Chief routes of eastern United States. Notice (1) the railway keeping to the eastern plains; (2) the value of rivers as routes across the mountain barriers; (3) the value of the Appalachian valley as a route.

Mohawk Valley being followed by no less than seven lines. Although many railways now cross the Appalachian barrier, the very easy gradients of this route still give it pre-eminence.

In summarizing the advantages of its situation, we may say that New York owes its greatness to the fact that it is on the

eastern seaboard facing the chief European countries, whilst its magnificent harbour, combined with its easy routes to the St. Lawrence, the Great Lakes and the Central Plains have made it unrivalled as a terminus and starting point for land and sea routes. New York is also a great manufacturing centre, and, as at Boston, one of the most important is the manufacture of clothing. Iron and coal are found near at hand, and the making of iron goods of all kinds is also very important. You know that New York has some very tall steel and concrete buildings which are called sky-scrappers. As will be seen from Fig. 41, there is not much room for expansion on Manhattan Island, so that it became necessary to build these huge structures.

Other routes across the Appalachians are shown on Fig. 43, the most important being those following the Susquehanna and Potomac rivers.

Philadelphia.—This city has a population of nearly two millions, and is the third largest city in the country. As we have already seen, it enjoys the advantages derived from being situated on the fall line of the Schuylkill and at the tidal limit of the Delaware. Like New York, it has in its neighbourhood quite a large number of other important towns. Being near to coal-fields it supplies coal to places along the Atlantic coast, especially to the New England manufacturing districts, whilst it is itself a great industrial centre, chiefly for the manufacture of machinery, locomotives and the making of steel ships, including warships. It has excellent railway connections with the cities to the north and south, whilst it is connected with Harrisburg and Pittsburgh by lines crossing the Appalachians. In what state are these three cities? You will recall that the Pilgrim Fathers settled in New England and the Dutch at New York. The Delaware area was settled by Quakers, who, under the leadership of William Penn, founded Philadelphia, the city out of which grew the state of Pennsylvania. One of the most notable buildings in the city is Independence Hall, in which the Declaration of Independence was made. Pittsburgh, although in close connection with the great cities of the east, is geographically situated in the Central Plains, and so we will consider it later.

Baltimore.—Like Philadelphia, this city has the double

advantage of being at the tidal limit and fall line of an important waterway. It is near to the coal and iron districts, and has become a great manufacturing town. South of Baltimore cotton growing becomes important, and this has helped its cotton manufacturing, for it has greater advantages than the New England cotton manufacturing towns on account of the fact that the raw materials for its manufacturing industry are close at hand. Iron manufacturing is also very important. Baltimore is the chief city of Maryland. This name was given by the Roman Catholic settlers who followed the Chesapeake and Susquehanna routes, and named their colony after Queen Henrietta Maria, wife of Charles I.

Washington is unlike New York, Philadelphia and Baltimore in one respect, because it was not founded until after the War of Independence, when, in order to avoid jealousy, it was decided to build a new capital city. Its makers knew that one day it would become a great city, and so it was carefully planned and to-day is one of the most attractive cities, not only in North America, but in the whole world. Its position on the Atlantic seaboard is accounted for by the fact that when it was founded in 1800, it was about the centre of the then settled area. It is situated in what is known as the District of Columbia (area, 60 square miles) which was ceded by Maryland in 1791. Its great buildings are not factories or workshops, but government buildings, chief of which is the Capitol in which the National Assembly meets.

Richmond stands at the tidal limit and on the fall line of the James, and has easy means of communication with the central plains. It is the most important city in Virginia. It was in this state that the chief settlements of English Churchmen were made, and the state received its name from Raleigh, who named it after Elizabeth, the Virgin Queen. Virginia is a great tobacco-producing state, and Richmond is the chief centre for this trade. Cotton is grown, although in insufficient amounts to supply the state's own needs. The chief cereals produced are maize and wheat, the former being five times as important as the latter. Nearly one-third of the population are negroes.

The states of North Carolina, South Carolina, Georgia and Alabama are southern Appalachian marginal states, but they are in climate and products so much like the southern Missis-

issippi states, that their fuller consideration will be delayed. In common with the states farther north, the Piedmont plateau and the Belted Coast Plains are present, but in these states they are much wider, as a glance at the map will show. Cotton, rice, as well as great quantities of maize, are the chief field crops. The sandy belts are pine-forested and lumbering is very important. Such towns as Montgomery and Macon, which are on the Fall Line (see Fig. 40), are noted for their manufacture of furniture, doors, etc. The negro population is very large, as will be seen by an examination of the figures quoted on p. 59. This is owing to the climate being unsuitable for white labour.

Notice the position of the town of *Atlanta* (Ga.) which is the largest in these four states. It is one of the few large towns away from a river, and is often called the "Gate City." In the south-east of the Appalachians there is no easy pass across the mountains, and so Atlanta has grown up at a meeting-place of routes at the southern extremity of those mountains. (See Fig. 43.)

EXERCISES

1. Compare the waterway from the Gulf of St. Lawrence to Lake Superior with that from New York to Lake Superior. Why was the Erie Canal constructed from Lake Erie and not from Lake Ontario?
2. In what ways has geographical position aided the growth of each of the following cities: Washington, Richmond, Baltimore, Philadelphia? Illustrate your answer by sketch maps.
3. Explain what is meant by (i) the Fall Line; (ii) the Belted Coastal Plain. Explain the origin of each.
4. Describe and account for the differences between the coastal lands in Maine and those in North Carolina.
5. Explain why it was that the Appalachians were a check on western migration. Why are they not such a serious obstacle to-day?
6. Fig. 43 shows the chief routes across the Appalachian barrier. Name the towns at the ends of each of these. Which line utilizes the Central Valley? Give the importance of the position of Chattanooga.

CHAPTER XVIII

THE CENTRAL PLAINS

IN Northern Canada there are the Barren Lands, and these merge into a forest belt, which in turn gives way to a prairie belt, in the cultivated parts of which wheat is the chief crop. This wheat belt stretches on both sides of the international boundary line. As we proceed southwards the temperature increases, as does the rainfall, and with these changing climatic conditions there are changes in the typical products. In the Upper Mississippi basin are the wheat lands; in the belt including the lower basins of the Ohio and Missouri and the central basin of the Mississippi, the chief crop is maize or Indian corn, whilst the southern states are in the cotton belt. We have learned that the high plains to the west lack rain, and thus stock rearing is more important than the growing of cereals. We shall consider the Central Plains of the United States under these sub-divisions: (1) The Wheat Belt; (2) the Maize or Corn Belt; (3) the Cotton Belt; (4) the High Western Plains.

THE WHEAT BELT

The wheat belt comprises the Upper Mississippi Basin and the states immediately south of the Great Lakes. Wheat is also grown in the Corn Belt, but it is not nearly so important. The climate and soil have been dealt with (see pp. 84 and 85). As in Canada, the best wheat lands are in the valley of the Red River, on the floor of an ancient glacial lake. Oats and barley are, of course, also very widely grown in this belt. The most important town in the United States wheat belt is *Minneapolis*, which has become the greatest milling centre in America, owing to the fact that it is located near the Falls of St. Anthony, on the Upper Mississippi. It is also a great lumbering centre. *St. Paul* is a great distributing and collecting centre for the smaller agricultural cities in the vicinity, and with Minneapolis makes a great "twin" city at

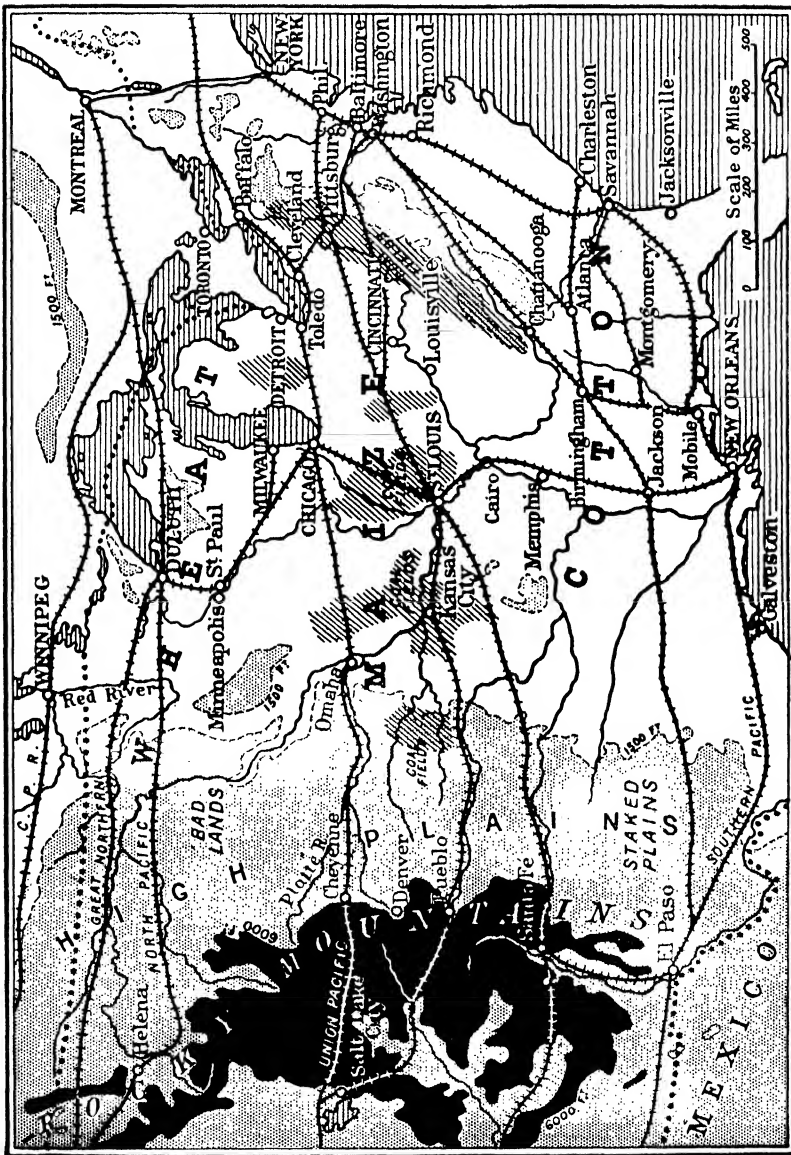


FIG. 44.—The Central Plains and the Basin of the Mississippi.

the limit of the navigation of the Mississippi. *Milwaukee*, on Lake Michigan, has excellent shipping facilities for its important flour-milling and iron and steel industries.

The chief outlets for the crops of the wheat belt are *Duluth* and *Chicago*. The former is the centre of a region producing timber and iron as well as wheat, and exports these in great quantities. Of *Chicago* we shall have much to say later. Other large towns in this belt, but on the Great Lakes, are *Detroit*, on the St. Clair river, between Lakes Huron and Erie, at a point where the Canadian roads and railways from the Lake Peninsula cross into the United States, and *Cleveland* and *Toledo*, on Lake Erie. The latter has ironworks and flour mills, whilst *Cleveland* is one of the largest and busiest towns on the Great Lakes. Its inhabitants are engaged in the building of steamers for lake navigation, in the manufacture of iron and steel goods, and in the refining of petroleum, these being in addition to a considerable trade in grain and lumber.

THE MAIZE BELT

On your atlas map which gives the political divisions of the United States find the following states: Ohio, Indiana, Illinois, Iowa, Missouri, Kansas and Nebraska. These are the chief maize-growing states, although other crops, such as wheat, oats, barley and tobacco, are by no means unimportant, especially the two former. This belt has longer, warmer summers than the wheat belt (see Ex. 6 at the end of this chapter), and that is why maize becomes of first importance. Maize is used for many purposes, but chiefly for the feeding of cattle and hogs and for making into bread. If the grain is required for the fattening of cattle and hogs it is cut before the frosts, so that the kernels are soft and juicy, for if left until after the frosts they become hard.

The slaughtering of cattle and hogs is very important in the towns of Omaha, Kansas City, Chicago, St. Louis and Cincinnati. Find these places on Fig. 44. Many of the cattle are brought to these centres by rail from the great ranching area of the high plains. The meat is packed in cans and sent to all parts of the country and to Europe. Naturally, the towns on the east coast will export the meat to Europe, and thus the Central States help to make eastern cities prosperous. The same applies to the vast quantities of wheat exported from the wheat belt.

But the maize belt is not only important for its maize, cattle,

hogs, etc. Parts of it are rapidly becoming great industrial areas. Notice the positions of the chief coal-fields as shown on Fig. 44. You will see (i) a coal-field on the margin of the Alleghany Plateau; (ii) a second, chiefly in Illinois, between the Mississippi and the Ohio; and (iii) a third farther west.

Besides coal, there are rich deposits of oil and natural gas, but these are not as widespread as the coal deposits, although great quantities are obtained in Western Pennsylvania, West Virginia, Ohio, Indiana, and other states in this belt.

The result of the discovery of these valuable minerals has been that the population in the Central States has increased

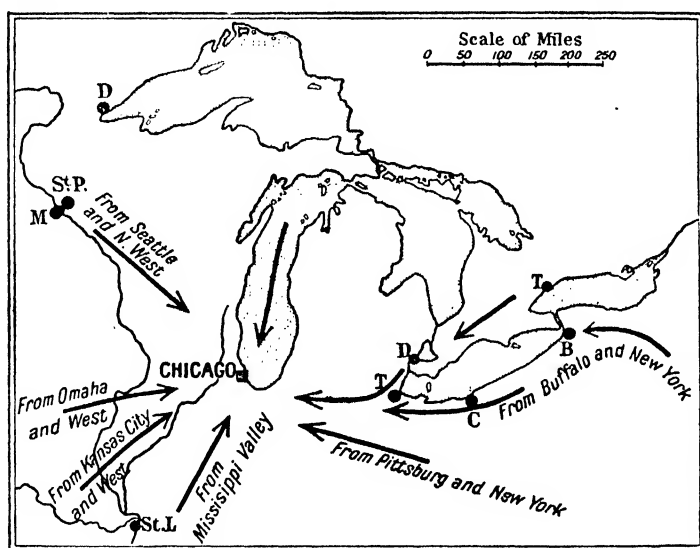


FIG. 45.—The position of Chicago.

enormously, and towns like St. Louis, Chicago and Cincinnati, which were formerly agricultural and slaughtering centres only, are now great manufacturing cities.

CHIEF TOWNS OF THE MAIZE BELT

Chicago.—The growth of this city has been phenomenal. In 1840 it had a population of 4,470; in 1870, 300,000; in 1890, 1,100,000; in 1910, 2,185,000 and in 1930, 3,376,438. This development is typical of that which has taken place in the Central Plains during these years, and owing to its ex-

cellent position, Chicago has shared that development to a remarkable extent.

Notice its position near to the southern extremity of Lake Michigan (see Fig. 45). At the beginning of the nineteenth century it was a small French trading port named Fort Dearborn. A small river, the Chicago, enters Lake Michigan at this point, its mouth giving a good, though small, harbour. Find on your map the river Illinois, which rises near Chicago and flows to the Mississippi. The watershed separating it from Chicago is very low and is crossed by a canal. You will readily see that Chicago is a great outlet for the trade of the Upper Mississippi basin. Look at the map again, and you will see that railways from the east coast north of Chesapeake Bay pass round the end of Lake Michigan in order to proceed north-westwards. In this way Chicago grew in size, and as it grew more railways were made, until at present it is a centre from which railways radiate to all parts of the country. It is within easy reach of coal, whilst iron ore can be brought by water from the southern shores of Lake Superior. It has, therefore, become a great engineering centre, especially for the making of railway stock, agricultural implements and machinery. Its position with regard to the wheat, maize, and stock-rearing areas has made it a great grain port, as well as the largest of all the towns engaged in slaughtering and canning. Reference has been made to the canal which connects Chicago with the river Illinois. Should this be made broad and deep enough to take large river ships, the city will then be reached by steamer, not only from the mouth of the St. Lawrence, but from New Orleans and the Gulf of Mexico.

St. Louis.—This city is on the river Mississippi, near to its junction with the Missouri, and not very far from the point at which the Ohio enters the main stream. The Mississippi can be bridged at St. Louis, and thus it forms an important point on east and west railways, whilst it is also on lines which follow the direction of the Mississippi. Thus land and water routes have made St. Louis a very important centre. It trades chiefly in the products of the maize belt, and has iron, boot, shoe, canning and tobacco industries.

Louisville, Cincinnati and Pittsburg are on the Ohio. The first is the centre of a rich tobacco-producing region, and of

recent years has also become a manufacturing centre. *Cincinnati* is even more important as a manufacturing centre. Its manufactures are very varied, but iron and steel, leather, pottery and clothing are of chief importance. It still retains its first importance as an agricultural and canning centre. *Pittsburg* is at the junction of the headwaters of the Ohio, the Alleghany and Monongahela rivers. The Alleghany gives routes to Lake Erie, the Monongahela and Potomac rivers make an easy route across the Appalachians, whilst the Ohio

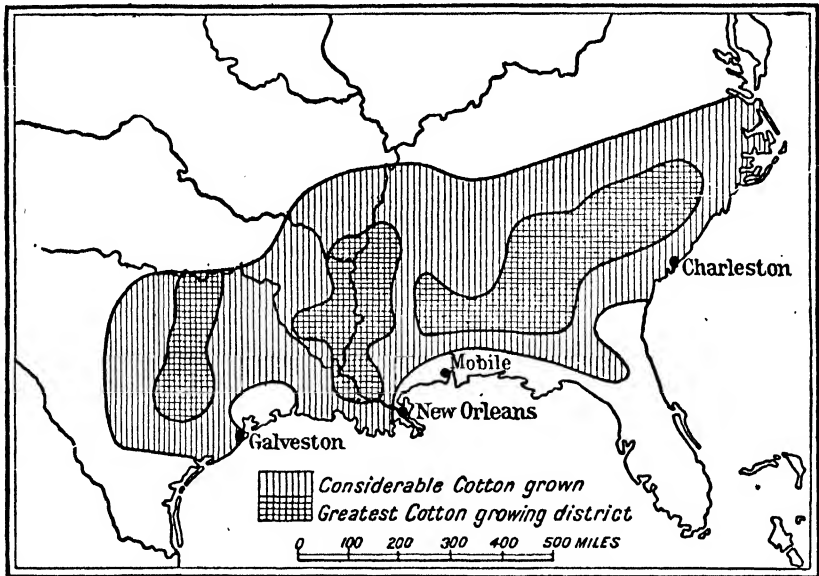


FIG. 46.—This map shows the area covered by the chief cotton producing region in the world.

leads westwards to the Mississippi. Originally a French fort, Fort Duquesne, it has grown enormously since the development of the great coal, iron, oil and natural gas resources of the district. Its iron and steel works cover a very large area. The local supplies of iron ore are now insufficient, and the deficiency is supplied by ore brought from the shores of Lake Superior.

THE COTTON BELT

The cotton belt comprises the states of North and South Carolina, Georgia, Florida, Alabama, Mississippi, Arkansas, Louisiana, Texas and Oklahoma. These states are so far

south that even the winters are warm, whilst the summers are hot. The physical map will show that they are largely low-lying plains to which the damp winds from the Gulf of Mexico bring an abundant supply of rain. An exception must be made to this in the case of western Texas, which is drier and forms part of the high plains. As in the Atlantic plains, the sandy belts are forested, pine trees which yield hard timber being the commonest trees. Rice is the chief crop on the low-lying, wet, coastal margins and is grown in all the coastal states from North Carolina to Texas. The rainfall of the coastal lands is too heavy for the principal crop, cotton, so that it is chiefly cultivated some distance inland. The climatic requirements for the successful cultivation of cotton are a long summer free from frost, for the plant is very sensitive to frost, and a moderate, but not excessive, rainfall. Too much moisture leads to an increased crop, but of poorer quality, whilst insufficient moisture causes a diminished yield. It usually takes about seven months from the sowing time, the end of March or early April, to the picking season, hence the necessity for a long summer. In this connection examine the figures giving the average monthly temperature of New Orleans. (See Ex. 6 at the end of this chapter.) In the United States, the seeds are planted in rows a yard apart, and when full-grown, the plants reach about the same height. The flowers produce a pod in which are the seeds and the cotton. The picking is done by hand, and when the seeds have been removed, the cotton is tightly packed into large bales, each weighing about 500 lb. In 1930 the Southern States produced over fourteen million bales of cotton, more than half of which was exported, very largely to supply the great cotton manufacturing region in south-east Lancashire. The seeds not required for sowing can be used in the manufacture of cotton-seed oil used in soap-making, and oil cake which is used for the feeding of cattle. Sugar is also grown, being especially important in the Mississippi delta and flood plains.

CHIEF TOWNS OF THE COTTON BELT

New Orleans, the largest city in this belt, is the chief cotton port. Its position on the Mississippi, which is a great highway of commerce, gives it water communication with towns so far away and apart from each other as *Pittsburg*, *Minneapolis* and

Kansas City. Find these places on the map. The immediate hinterland of this port is the Mississippi basin portion of the cotton belt, but owing to the ease with which the Mississippi can be navigated by large steamers, it is a gateway to the greater portion of the basin, whilst railways from the Coastal Plains, the Appalachian valley, the Mississippi basin and the west coast converge upon it. (See Fig. 44.)

You will remember that the city was originally founded by the French. It still numbers among its 460,000 inhabitants very many who are of French descent and are French-speaking.

Galveston, Mobile, Savannah and Charleston are all engaged in exporting cotton and timber. *Atlanta*, the "Gate City," has already been noted (p. 119). The presence of a coal and iron field on the western flanks of the Alleghany plateau has been mentioned, and we have just learned that west, south and east of the southern Appalachian system, cotton is grown. You will recollect, too, that the chief cotton manufacturing area is in the New England states, and perhaps you have already wondered why cotton is not manufactured where it grows, especially as great supplies of coal and iron are either on the spot, or within easy reach. The development of cotton manufacturing is rapidly taking place, and every year sees an increase in the number of mills. One difficulty has been the obtaining of workpeople, for although he is much more advanced than formerly, the negro was not quite suitable for the skilled work required.

Notice the town of *Birmingham* at the southern end of the Alleghany plateau. In 1880 it had a population of 3,000 which had increased to 60,000 in 1900; whilst at the census of 1930 its inhabitants numbered 260,000, and it is now the centre of a coal and iron region only second in importance to that of the Pittsburg area. Besides iron and steel goods it manufactures cotton. There are scores of other towns which are now engaged in cotton manufacturing, amongst which *Atlanta, Augusta and Columbia* have already been mentioned in other connections. What special advantages for manufacturing have *Augusta and Columbia*? Now find *Memphis*, which is the largest city on the Mississippi between New Orleans and St. Louis. It is a great market for raw cotton and timber.

FLORIDA

Florida deserves a little special mention. The southern portion consists of limestone and in this part of the state a large number of lakes occupy hollows where the limestone has been dissolved. *The Everglades* is a region almost impenetrable on account of the dense vegetation and swamps. Find the town of *Key West*, which is situated on one of the long line of coral islands stretching westwards from southern Florida. Besides being an important naval station, it has many tobacco factories owing to its nearness to Havana in Cuba. The town is reached by a railway which crosses long bridges on its journey from island to island.

As it is so far south, Florida has a very high temperature, and so tropical and sub-tropical fruits, such as pineapples, coco-nuts, bananas, oranges and lemons can be grown, and these form important exports. Even in winter the temperature is warm, and many towns are engaged in catering for visitors from the colder northern states, whilst in the hot summer many of the richer inhabitants of Florida travel north. *Jacksonville*, the largest town in the state, *Palm Beach* and *Miami* are noted winter holiday resorts.

THE HIGH WESTERN PLAINS

Fig. 44 shows that the western tributaries of the Mississippi (Missouri, Platte, Arkansas, etc.) flow across the highest portion of the Central Plains, which rise gradually as the Rockies are approached. The Canadian portion of this belt of High Plains is found in the province of Alberta. We have learned that west of Longitude 100° W. the rainfall is generally too little for agriculture, except where irrigation is possible. These vast plains, treeless except near rivers or sources of water, have extensive grass-lands, and therefore the chief occupation is stock-rearing. The cattle can remain out of doors all the year round, for not much snow falls; whilst owing to the dryness, the grass is turned into hay by the sun without being cut.

The ranches are usually of very great size, because it is necessary to allow the cattle to roam long distances in search of food. As a rule, the "round-up," or gathering together of the cattle, takes place only twice yearly. The first is in early summer, the object being to brand the calves which have been

born during the winter. As there are no fences on the plains, cattle from different ranches get mixed, thus making it necessary to brand them by some distinctive letter or sign in order that those belonging to different owners can be distinguished. The second round-up takes place in the "fall," or autumn, and its object is to select cattle for killing. These are despatched by train to Chicago, Kansas City and Omaha to be slaughtered. Whilst rounding up the cattle, or moving them from one place to another, the cowboys ride long distances every day, sometimes even so much as between 60 and 80 miles, and very often are forced to spend day and night in the saddle. It is no wonder, therefore, that they are excellent horsemen.

There are some parts of the High Plains which are unsuitable for cattle-rearing. Find on Fig. 44 the areas marked Bad Lands and Staked Plains. The former are chiefly in South Dakota and the latter in western Texas. *The Bad Lands* were formerly the beds of old lakes in which were deposited layers of sandstone, limestone, clay, etc. The area suffers very much from lack of water, but when rain does fall, every little temporary stream is at work wearing out a steep gully. There is little or no washing in of the sides, so that steep sides are not rounded. One writer says of the Bad Lands that their name is expressive of the strangest, and in many respects, the most repulsive, scenery in the world. They are of no use either for stock-rearing or agriculture.

The Staked Plains.—These plains are situated in western Texas and eastern New Mexico. Like the Bad Lands they lack rain, and owe their name to the fact that through the scarcity of water, travel routes were at first marked out by stakes. Underground sources of water have been found, and parts of the region have become good ranching country; but on the whole the Staked Plains have well been described as "an ocean of prairie desert."

CHIEF TOWNS

The chief ranching centres are *Kansas City* and *Omaha*. Each of these towns is a great market centre for cattle, horses, sheep, hogs and grain, and as they are nearer the ranching area they have some advantage over Chicago as canning and packing centres. Both are on the Missouri, near

to junctions with important tributaries. What advantage does such a position give?

CHIEF ROUTES OF THE CENTRAL PLAINS

Railway construction is easiest in this part of the country. In connection with the consideration of the positions of Chicago, St. Louis and New Orleans, we have seen how routes from the east coast converge upon those cities. Examine Fig. 44 and find the towns of Helena, Cheyenne, Pueblo, Santa Fé and El Paso. They all control passes or easy routes along which the railways can pass on their way westwards from the three cities just mentioned.

EXERCISES

1. What are the climatic conditions which help to give a great variety of productions in the Mississippi basin?
2. What advantages does each of the following cities owe to its geographical position? Add a sketch map on which are indicated the points made in your answer: St. Louis; Pittsburg; New Orleans.
3. Describe a "round-up" on a large cattle ranch.
4. Describe a journey on a Mississippi steamer from St. Louis to New Orleans.
5. In what ways are the Southern States and the New England States dependent upon each other?

6. MEAN MONTHLY TEMPERATURES, DEGS. FAHR.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Average for Year.
St. Paul . . .	12	15	28	46	58	67	72	70	60	48	31	19	44
St. Louis . . .	31	34	44	56	66	75	79	77	70	58	43	36	56
New Orleans . . .	53	56	62	68	74	80	81	81	78	70	61	54	68

MEAN MONTHLY RAINFALL IN INCHES

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Total for Year.
St. Paul . . .	.9	.8	1.6	2.3	3.6	4.4	3.4	3.5	3.4	2.3	1.3	1.1	28.7
St. Louis . . .	2.3	2.8	3.4	3.5	4.2	4.5	3.4	2.7	2.9	2.4	2.9	2.2	37.2
New Orleans . . .	4.6	4.5	5.3	4.9	3.9	6.2	6.5	5.6	4.8	2.9	3.8	4.5	57.4

St. Paul, St. Louis and New Orleans are in the wheat, corn and cotton belts respectively. On squared paper draw graphs to illustrate these figures—one for the temperature and one for the rainfall. What can you learn from the graphs?

THE MISSISSIPPI RIVER AND THE WORK IT IS DOING

IN Chapter III we considered the making of mountains, plateaus and plains, and several times reference was made to the denudation of these features. Nature is full of change, and although in a man's lifetime there appears to be little alteration in the physical features with which he is very familiar, slowly but surely changes are taking place. The growth of a mountain range is accompanied by an attack on that growth by the forces of Nature, which in time, however far distant that time may be, will completely alter its appearance and wear it down to a low level. Sunshine and rain, heat and cold, frost and ice, wind and running water are the attacking forces. In this chapter we shall learn something of the work accomplished by running water, and at the same time learn more of the Mississippi River, for in the last chapter we considered the climatic belts into which its basin may be divided, but very little was learned of the river itself.

In the first place, the Mississippi, whether we consider its length, the area which it drains, its volume, or its navigable waterways, is one of the world's greatest rivers. The following figures will give some idea of the greatness of this river system:—

River.	Length in Miles.	Area Drained (in square miles)
Mississippi-Missouri	4,200 }	1,253,600
Mississippi	2,490 }	
Missouri	2,900	519,500
Arkansas	1,514	185,671
Red River	1,200	89,970
Ohio	1,200	201,720

The total navigable waterways of the Mississippi Basin exceed 10,000 miles. The name "Mississippi" means "Father of Waters." The river rises in Minnesota, in a small lake which is situated amongst glacial hills. In its upper course there are many waterfalls, the chief of which are the Falls of

St. Anthony, which give power for milling to Minneapolis. Below these falls, the river enters upon its middle course and receives two long tributaries, the Missouri (which itself has large rivers such as the Platte and the Kansas flowing into it) and the Ohio. Below Cairo is the lower course, the chief tributaries joining in this section being the Arkansas and the Red River, both of which come from the west. In its lower course, the Mississippi flows across a plain which varies in width from 20 to 75 miles and is in length about 600 miles. At the mouth there is an enormous delta, to which it is estimated the river brings 400,000,000 tons of sediment yearly, causing its front to advance about 340 feet per annum. It has also been estimated that every year the Mississippi carries to the sea 2,850,000,000 cubic feet of mineral matter in solution. It may be noted here that the salt in the sea has been carried there by rivers.

Now let us see what work the river is accomplishing. We have divided it into (1) the upper course, (2) the middle course, (3) the lower course. All rivers may be so divided, so that it is useful to dwell upon these for a short time.

THE UPPER COURSE

Rivers have their sources in springs, lakes, or glaciers, and these are supplied by rain or snow. Evaporation is constantly taking place over the great water masses, especially the oceans. Winds carrying the water vapour pass over the lands, and on meeting highlands are forced to rise, thus causing the precipitation of rain, or on the higher levels, of snow. The latter either helps to feed glaciers, or, on melting in the spring or summer, supplies rivers with an abundance of water. Of the rain water, much goes back to the air by evaporation, but a great deal of that which sinks into the ground, eventually, perhaps in some cases not for months, finds its way back to the surface in the form of a spring. It is this water which is so useful in keeping up the supply of water in a river, for, if it were to depend entirely upon the surface water which quickly gets into a river after rains, it would run dry between the rains. Whether fed by rains, or snow, or both, the river is the means whereby the land is drained, and the water once more reaches the sea.

The Mississippi rises in a small lake, and there enters upon

its upper course. Since the slope of the bed is here greatest, it follows that the river will flow fastest, and will have sufficient strength to move along loose stones which will rub against the bed and deepen it. The sides of the valley are steeper near the source, as the river bed is lowered more rapidly than the sides are won back. Rock fragments are loosened and get washed into the stream by the rains, and this increases the load the river has to carry. Some of these will be too large for the current to move, except during floods, but smaller stones are continually being driven against them and in this way they get worn. During floods, most of the rock waste will be carried on at a considerably increased rate, and this enables the river to accomplish its work of cutting downwards its bed at a much more rapid rate than in normal times.

One of the characteristics of the upper courses of rivers is waterfalls, for some streams have to make such rapid descents, that they sometimes leap from height to height in a series of waterfalls or cascades. Waterfalls are also found where streams flow over strata of different hardness. Softer rocks are more easily cut through than hard rocks, so that often waterfalls are met with where streams flow from hard to soft layers. You will remember that the falls ~~on the~~ "Fall Line" are due to this, but the best example of all is at Niagara. Here, the work of cutting upstream is retarded by the harder layers resisting erosion until the softer layers are removed from below. (See Fig. 29.)

Thus we see that in their upper courses rivers are vigorous, the valley sides are steep, and it is here that waterfalls or rapids are to be found. These conditions are met with in the upper course of the Mississippi and in the mountain courses of its great tributaries.

THE MIDDLE COURSE

Since the slope of the bed in this section is less steep, the river will flow more slowly, and thus will be able to pay more attention to the widening of its valley. Obstacles, which would be easily overcome in the upper course, are often sufficient to make a river turn aside in its middle and lower sections. The river swings from side to side, wearing not only its bed, but its banks, and since in the case of the Mississippi, the Ohio and the great western tributaries, this

part of the course is over loose material, they have broadened their valleys considerably, so that they now flow across plains bordered by low buffs. (See Fig. 47.) In times of flood, the stream exceeds its ordinary bounds and its waters spread over the valley depositing silt or alluvium, building in the course of time, flood plains, in which, due to the looseness of the soil, it is not difficult for the river to swing or meander from side to side of the valley or to change its course. In spring and early summer, when the snow on the Rockies is melting, the western tributaries are very much greater in volume than at any other time of the year. The Missouri has a maximum volume in June, containing in that month about thirty times as much water as in November, when it is at its lowest, whilst it carries along so much sediment that it is known as "Big Muddy." The Platte is so loaded with sediment that it has a great difficulty in getting through the vast amount it has brought down and deposited in its valley. You will readily see that since the current is not so swift in the middle as in the upper course, much sediment has to be dropped to the bottom.

THE LOWER COURSE

The Mississippi enters upon its lower course below Cairo and for six hundred miles flows across a low flood plain varying in width from twenty to seventy-five miles. The upper portion of this section is bordered by bluffs which recede farther and farther from the river, and finally disappear before the coastal plains are reached. Memphis and Vicksburg are situated on the eastern bluff at points where the river swings against it. In the flood plain portion of the valley there are many lakes known as "cut offs," or "ox-bow" lakes, whose formation is illustrated in Fig. 48. The river meanders to such an extent that in time it forms great loops, some of which are five miles in diameter. It cuts through the neck of the loop, leaving as a lake a portion of its old channel. In this way the river straightens itself, only to go on repeating the process.

In the lower course so much sediment is deposited on the bed, for the current is not strong enough to carry it all to the sea, that the level of the water is constantly rising. Successive floods have built natural embankments, which, as you would

expect, are highest near the river, but very often these embankments, or levees, are not strong enough to keep the river to its channel and disastrous floods occur, the cotton plantations

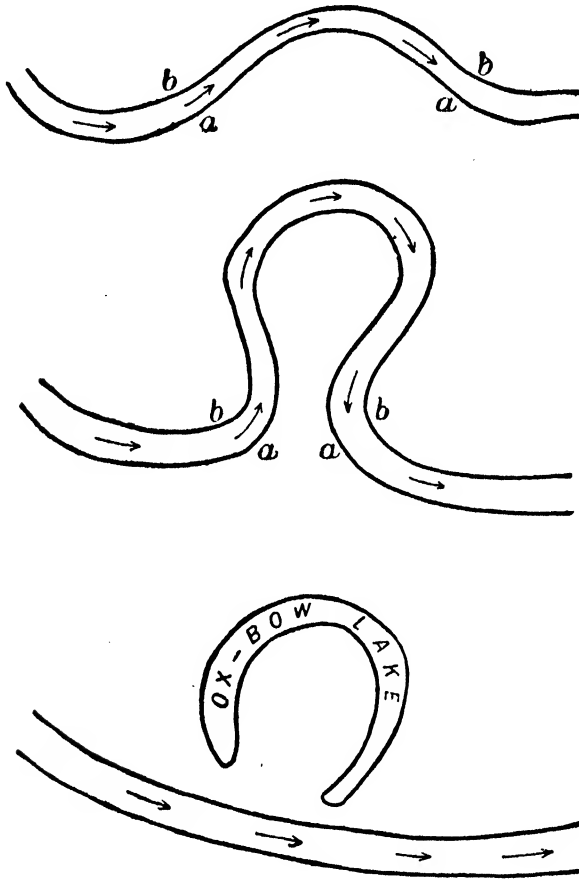


FIG. 48.—These diagrams illustrate the formation of an ox-bow lake. A meandering river forms a loop, and since cutting of the banks takes place at "a," the neck of the loop is eventually cut through, the river straightens itself, and an ox-bow lake is formed. Note the ox-bow lake on Fig. 47.

especially suffering. It is therefore necessary to strengthen the levees or to build artificial embankments.

Much of the lower valley of the Mississippi is land that has

been reclaimed from the sea, for so much sediment is brought to the Gulf of Mexico that the land area is being added to every year. Deltas are more easily formed in shallow than in deep seas, in seas where there is little rise and fall of the tide, and along coasts where uplift of the sea bed has taken place. The Mississippi has all these advantages, and the growth of its delta has accordingly been increased. The load of sediment has to be dropped when the current receives a check, and this load is so great that the river pushes out finger-like projections before filling up the sea in between. Notice on Fig. 49 how Garden Island Bay has been silted up owing to a break being formed in one of the distributaries or channels by which the river is enabled to carry its waters over the flat delta plains to the sea. The same figure also shows jetties which have been constructed in order to force the current to run fast enough to keep the passes open and deep enough for ships, and to confine the water to definite channels.

Thus we see that rock waste from the Appalachians, the Central Plains and the Rockies is being brought by the Mississippi to help it in its great task of filling up the Gulf of Mexico, whilst year by year its own basin is being slowly but surely lowered.

All rivers have not reached the same state of advancement as the Mississippi. Some, from mouth to source, are more like the upper course of the Mississippi and may be described as youthful. Some have advanced farther and perhaps are doing little cutting downwards, but are busily engaged in broadening their valleys. These may be described as having reached middle age, or as mature rivers. Some rivers have so reduced their slope from source to mouth, that there is no more cutting downwards of the bed taking place; they have valleys gradually broadening from upper to middle courses, and in the latter and lower courses extensive plains which they themselves have built up, and on which man can develop great agricultural industries. Such a river may be said to have reached old age, a condition almost reached by the Mississippi. (Fig. 51.)

You must not think that because one river has a youthful appearance, it is therefore younger in years than one which has the appearance of old age, for some rivers have more work to do than others and do it under less favourable conditions.

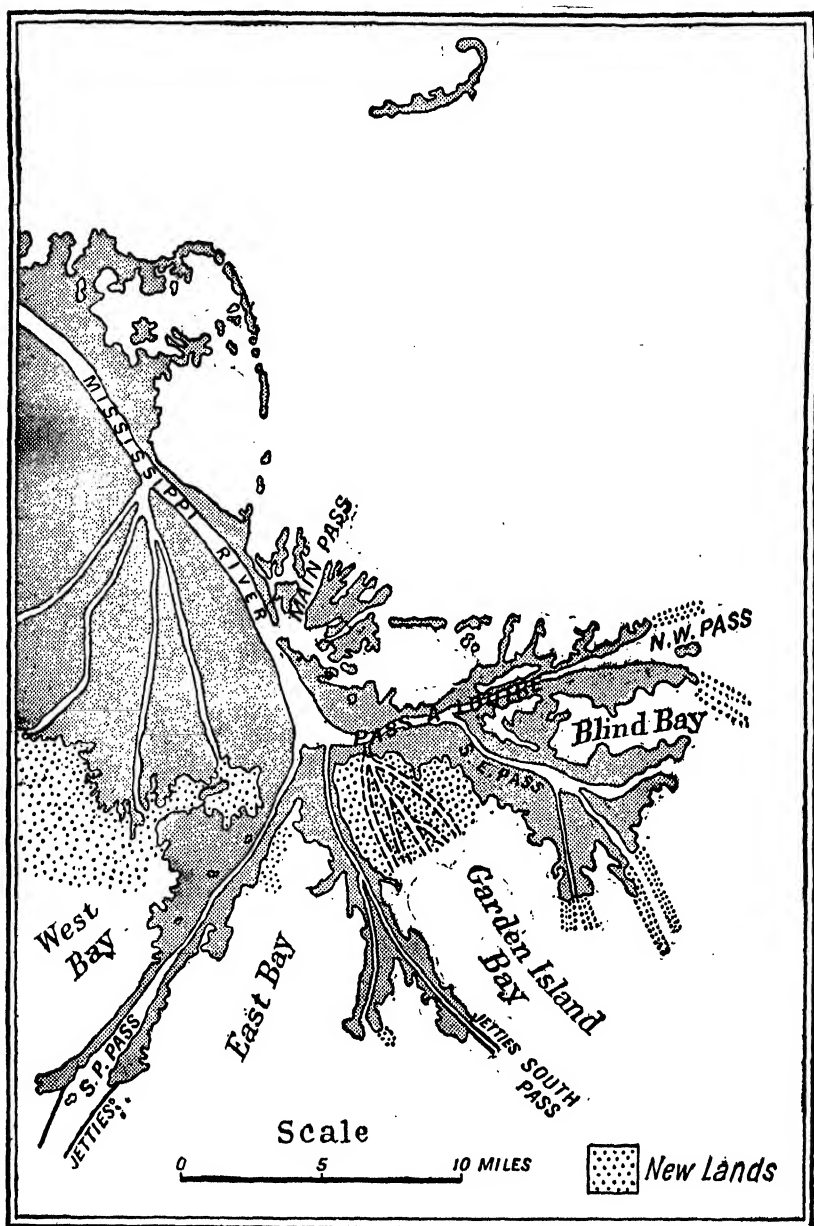


FIG. 49.—Map of the delta of the Mississippi. The “new lands” have been made since the last survey. Notice the finger-like projections.

An example of such a river is the Colorado, which we shall consider later. Again, a river may reach old age and then be rejuvenated, as was the St. Lawrence when the ice-sheet turned

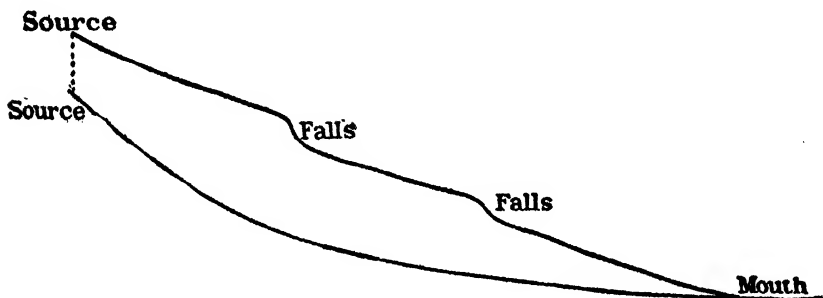


FIG. 50.—The upper line shows the profile of a river in youth. The lower line shows the profile when waterfalls have disappeared. It should be noted that even in old age the greatest slope is nearest the source.

its waters over an escarpment and formed Niagara Falls. Rejuvenation has also occurred in the upper courses of the Mississippi itself. An uplift of the area in which a river has

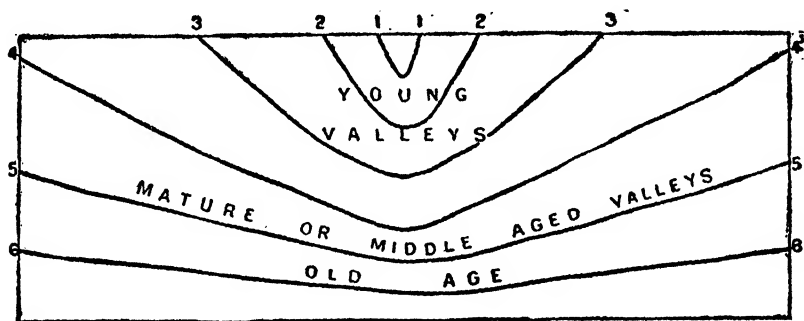


FIG. 51.—This diagram shows successive sections of a river valley during its history from youth to old age.

its source will also cause it to begin again at the task of reaching its base line, that is, attaining such a slope of bed from source to mouth that the river has ceased to lower its bed, therefore having no waterfalls or rapids in its course (Fig. 50). This does not mean that the river has no more work to do, for it has still to complete the work of widening

its valley, and finally of reducing its basin to a rough plain (Fig. 51). This work is first accomplished near the mouth, but in time is actively carried on near the source, where youthful streams may exist for a very long time.

EXERCISES

1. Make a rough wooden trough, and having placed sand, clay or gravel on the bottom, allow water to run down it. Vary the rate at which the water runs and write a short account of your observations.

2. Make an examination of the nearest stream to your home or school. If you can do so, visit its source and find reasons for its position. Examine a bend and compare the rate of flow and the depth of the stream at both banks. Which bank is steeper? Where is sediment being deposited? Can you find a flood plain? Examine stones taken from the bed. Which part of the stream moves fastest? Why? If possible, visit the stream after heavy rains and note any difference you observe. Get a sample of the river water. Is there much sediment? If there are any "cut-offs," make drawings of them. Examine a pond or lake into which a stream runs. What traces of a delta can you find?

3. Explain the formation of each of the following: deltas, flood plains, waterfalls, ox-bow lakes. Add diagrams to illustrate your answer.

4. At what points along a river are important cities likely to be found? Give examples from the Mississippi Basin.

5. What do you understand by the use of the following words in connection with rivers: youthful, mature, old age?

6. Compare the Mississippi and the St. Lawrence as regards (a) navigability for commercial purposes, (b) the character of their basins, (c) the character of their mouths.

THE WESTERN HIGHLANDS

IN Chapters II and V we have described the physical features and climate of this region, and have seen that it may be divided into the following units: I. The Basin of the Columbia-Snake; II. The Great Basin; III. The Colorado Plateau; IV. California.

I. THE BASIN OF THE COLUMBIA-SNAKE

The Columbia should be compared with the Fraser. It flows through an area rich in timber, it is noted for its salmon fisheries, whilst its lower valley is a great agricultural region. Notice on Fig. 52 the extensive area in the lower valley below 1,500 feet. Next to the Central Plains this is one of the chief wheat-producing areas in North America. It is also a great fruit-growing region.

The Snake flows across a great lava plateau in which it has cut a deep canyon (see p. 28). Unlike the Columbia Valley, which receives rains all the year round from the westerly winds, the area drained by the Snake has insufficient rain, for it is to the lee of the Cascade and Sierra Nevada Mountains. Large areas are semi-desert, and only in the more exposed, and therefore wetter, parts is agriculture carried on.

You will therefore expect that the chief centres of population will be in the lower valley of the Columbia. The largest town is *Portland* (Ore.), which is 120 miles from the mouth of the Columbia. Farther north, on Puget Sound, are *Seattle* and *Tacoma*, both of which are in Washington. These ports trade in wheat, lumber, wool, canned fruits and salmon.

Yellowstone Park.—This region, which is not quite as large as Yorkshire, lies in the Rocky Mountains in the north-west corner of the state of Wyoming. It is on the watershed, or Great Divide, between rivers flowing westwards and those flowing to the Mississippi, and is at an elevation of about 7,000 feet above sea level.

The Park contains, amongst other wonderful things, hot springs, boiling mud springs of very many colours, geysers, canyons, lava flows and extinct volcanoes, besides beautiful lakes, waterfalls and magnificent forests. The whole area has been set aside as a National Park so as to preserve for ever

one of the most wonderful regions in the world. The laws also protect animals and birds. One very famous geyser deserves special mention. It is called "Old Faithful," be-

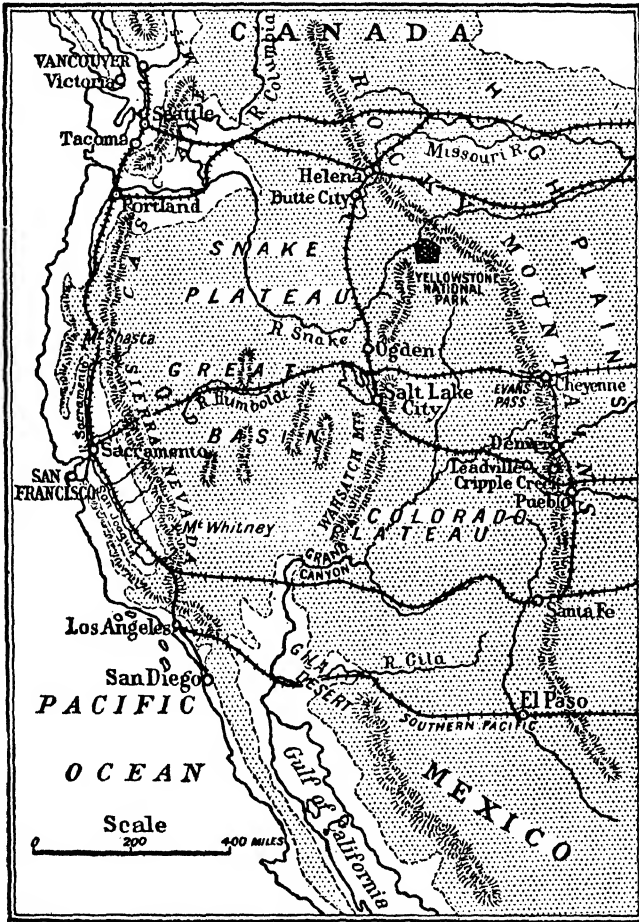


FIG. 52.—Map of the Western States. The shaded areas are over 1,500 feet in elevation.

cause with the greatest regularity it shoots, every sixty-three minutes, a great column of water to a height of from 120 to 150 feet. There must be a narrow tube in which water collects after an eruption. This water is heated, perhaps by hot lava rocks deep in the earth. Owing to the weight of

water above, that near the bottom of the tube has to be heated much above the ordinary boiling point before it can change into steam. When it reaches the required temperature and changes into steam, it lifts the column of water above and some flows away at the surface. This, of course, reduces the pressure, and immediately more of the intensely heated water can change into steam, the great force of which can send the column of water in the tube, high into the air. After an eruption, the noise of escaping steam can be heard. In the case of "Old Faithful," it takes about sixty-three minutes for this process to be repeated. Some geysers, such as the "Minute Man," erupt every few minutes, but their columns of water are only sent a few feet, others erupt every few hours or days, whilst many have become inactive.

II. THE GREAT BASIN

This plateau region is bounded on the west by the Sierra Nevadas and on the east by the Wahsatch Mountains, and is crossed by many north and south ranges (see p. 22). The Great Basin, like the Snake plateau, lacks rainfall and for the same reasons.

There is not *one* large basin of inland or continental drainage, but many, for there are many rivers which drain the basins between the parallel chains and find their mouths in salt lakes of varying size. The largest river is the Humboldt, which is over 500 miles in length. It flows east and west and ends in Lake Humboldt. The largest lake is Great Salt Lake, which is only a remnant of a former lake of much greater size. On the sides of the surrounding mountains are beach lines and wave-cut caves, which indicate its former extent at a time when the rainfall exceeded its present amount. When the amount of water taken away by evaporation began to exceed that brought by rainfall, the lake began to shrink in size. The former extensive lake, known as Lake Bonneville, was a fresh-water lake, but continued evaporation made the lake more and more salt. When it ceased to have any outlet, there was no means of getting rid of the salt. Large areas which once were the bed of the lake are encrusted with salt, and the Great Salt Lake itself contains so much dissolved mineral matter, that a man cannot sink in its waters.

Despite the prevailing drought, the district surrounding

Salt Lake City has, by careful irrigation, been turned into farming lands. *Salt Lake City*, the largest town in this region, had a population of 140,000 at the census of 1930. The greater portion of these are Mormons, a peculiar sect founded in 1830. It is the Mormons who, by irrigation, have reclaimed former wastes. The discovery of minerals, however, brought to the district a mining population, and this, together

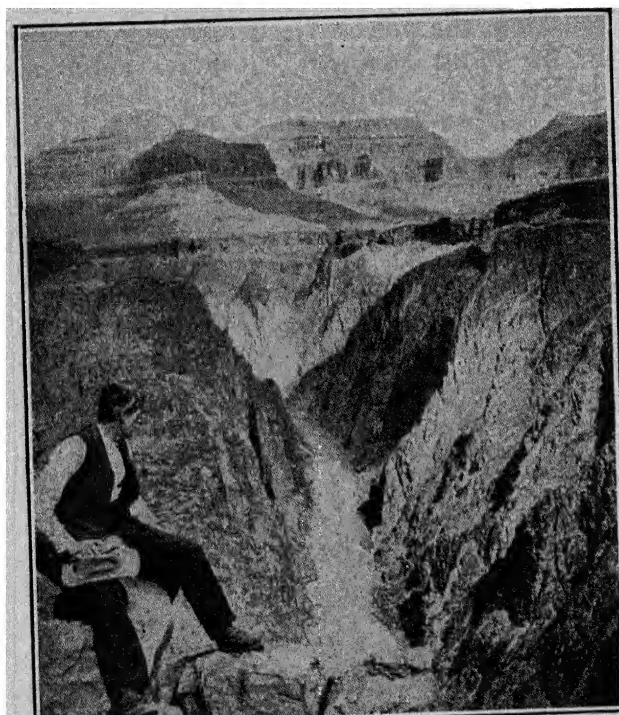


FIG. 53.—The Colorado Canyon. Study this in connection with Fig. 54.

with the making of the railways, has resulted in the settlement of large numbers of non-Mormons. The main railway line between Chicago and San Francisco passes through Ogden, which is north of Salt Lake City.

III. THE COLORADO PLATEAU

This region, like the Great Basin and the Snake plateau, is arid, large areas being true desert.

The rivers, which rise in the Rockies and thus are supplied

by snow and rain, have cut deep canyons in the plateau. Of these the most notable is that of the Colorado River, which flows for nearly two thousand miles across an arid country. In this remarkable canyon the rocks are arranged in layers, one on the top of the other. They are sedimentary rocks which were once deposited at the bottom of seas and now form a plateau, in parts over 8,000 feet above sea level. The deepest of the canyons is the Grand Canyon, in which the river for over 200 miles flows at the bottom of a chasm over 6,000 feet in depth, and varying in breadth from 10 to 12 miles. The journey from the edge of the cañon to the river below is long and difficult. How was the river enabled to

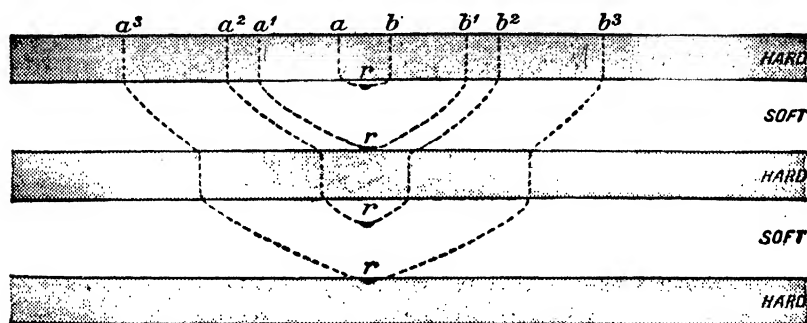


FIG. 54.—This diagram shows successive sections of a river which flows over an area of horizontal strata arranged in alternate layers of relatively hard and soft rocks.

make this large chasm? We have learned that, as rivers become older, they tend to reach what we have called "base-line," and in order to do this they must lower their beds. But in places where there is plenty of rain, not only does the bed become lower, but the sides are weathered, and the river valley becomes shaped like the letter V. But the Colorado and its tributaries flow over an arid region, and the work of broadening the valley takes place very slowly, so that the river keeps on deepening its valley, which is shaped like a very narrow letter V. What irregularity of outline the sides of this valley or canyon possesses is due to the fact that some layers of rock are softer than others, so that they form gentle slopes, whilst the harder rocks stand out as steep slopes or cliffs (Figs. 53 and 54). One of the most wonderful sights in this canyon is the colouring of the rocks; the grey of the

limestone, the red of the sandstone, and the darker colours of the very old layers below the sedimentary rocks, through which the river has now cut. Needless to say, such a river valley makes communication between opposite sides very difficult indeed, for no railway can cross. It will readily be seen that in time the river will divide the plateau into a number of tabular blocks of mountains. There are many flat-topped, steep-sided mountains in the Colorado basin, and they are known as *mesas*, which is a Spanish word meaning table. The smaller flat-topped mountains, which are often detached portions of mesas, are called *buttes*. Mesas form excellent sites for the Pueblo Indians to build their dwellings upon.

The work the Colorado is doing is much the same as that done by the Mississippi. The former has more to do, and, owing to the aridity of the region it drains, takes longer to do it. But eventually the valleys will grow wider and wider, the surface will be reduced in height, and in its old age the Colorado basin will be almost level again.

In its lower course, the Colorado flows across true desert lands, for here the prevailing winds are the Trades. To the west of the river is the Mohave Desert in California, and to the east the Gila Desert in Arizona.

The areas of greatest population are either the railway or mining centres, although in the high plains between the ranges of mountains, and in the valleys of many of the rivers rising in the Rockies and flowing to the plains, some agriculture and stock-rearing are carried on. Here, intermont plains are called parks. Notice the favourable positions, at the entrance to parks, of Helena, Cheyenne, Denver and Pueblo.

IV. CALIFORNIA

The state of California includes the Mohave Desert and a small area of the Great Basin, but the most important portion is the *Californian Valley* lying between the Coast Range and the Sierra Nevada, and drained by the Sacramento and San Joaquin rivers. This flat plain has been made by the sediment brought from the neighbouring mountains by rivers. A break in the Coast Range gives these rivers an outlet to the Pacific, and gives San Francisco its magnificent harbour. The Californian Valley has a climate like that of the

countries bordering the Mediterranean Sea, its warm dry summers and cool winters being admirable for such fruits as vines, mulberries, oranges, lemons and figs, as well as for the production of great quantities of wheat. The coastal lands are cooler in summer than the Californian Valley, where great heat is experienced. The rainfall is also less in the sheltered plains, and in the drier areas it is necessary for irrigation to be practised, water for this purpose being supplied by the rivers which rise in the high Sierra

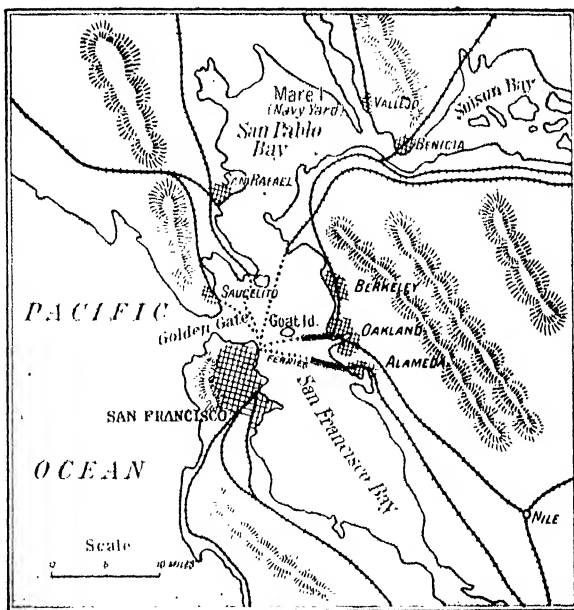


FIG. 55.—San Francisco and its environs. Note the extensive area occupied by San Francisco, San Pablo and Suisun Bays. These are connected to the Pacific by the Golden Gate. A magnificent bridge now crosses the Golden Gate and another joins San Francisco to Oakland.

Nevadas. Success has rewarded the efforts of the government, private companies or individuals who have planned irrigation schemes, so that even in the droughty summer the fields shall have water.

San Francisco (population: 635,000 in 1930) has a magnificent situation, as Fig. 55 shows. The break in the Coast Range, which was formed by sinking, is the entrance to the

large San Francisco Bay, and is known as the Golden Gate. From the mouth of the Columbia to San Diego, near the Mexican frontier, there is no other good harbour, so that the port has no immediate rivals. The produce of the Californian Valley finds an outlet through San Francisco, and has given that city many industries, such as flour milling, fruit packing and preserving, woollen manufacturing, etc., which are based on these products. The building of steel ships, both war and merchant, is a very important industry. A disadvantage from which San Francisco suffers is the lack of coal, but against this, California is the greatest oil-producing state in the country. Railways from the east converge upon the city, whilst its ships sail to all parts of western America, the Sandwich Isles, eastern Asia, New Zealand and Australia. Moreover, the Panama Canal has made the port more important than ever.

The city was partly destroyed by earthquake and fire in 1906, but since then a new and more beautiful city has arisen. Fig. 55 shows that there are many towns near to San Francisco, the largest being *Oakland* (284,000), which is connected with *San Francisco* by bridge and ferry. *Berkeley* has about two-thirds of the 18,000 students of the noted University of California.

Los Angeles, the largest city in California, had a population of 1,238,000 in 1930. In 1890 its inhabitants numbered 50,000. This increase is due to the extremely valuable deposits of oil which have been discovered there; to the development of fruit- and wheat-growing industries, and to the tremendous growth of the cinema film-making industry at *Hollywood* which forms part of Los Angeles. *Sacramento*, the capital of the state, is on the river of the same name, and comes sixth in size, with a population of 94,000.

Mining in the Western States

It was mining which first attracted settlers to the western states, and the industry has so grown that to-day they form one of the most important gold, copper, silver and lead mining regions in the world. The first great rush of miners took place in 1848, when gold was discovered in the gravel of the beds of Californian rivers. The gold had been washed into the rivers

as the rocks which contained it crumbled, and being heavy, had sunk to the bottom amongst the gravels of the river bed. The first miners obtained it in a very simple way, for all it was necessary to do was to place river gravel in a pan of water and rock the pan so that the heavier gold became separated from the lighter materials. Very little "panning" takes place to-day, for most of the gold so easily obtained has been taken away. River gravel is now raised and gold separated therefrom by the most elaborate and complicated dredging machines; sometimes the gold is washed from gravel by powerful jets of water, but most gold-mining is done by sinking shafts from which tunnels follow the veins of gold in the hard solid rock.

The chief mining centres are in the Sierra Nevadas and the Rockies, and in most places gold, silver and copper are found together, but naturally in varying quantities. The most important copper mines in the world are at *Butte City*, in Montana; gold is mined at *Helena, Montana*, and *Cripple Creek, Colorado*, and lead at *Leadville, Colorado*. *Denver* is the largest of all the mining centres, although it is more important as a centre for the surrounding mining towns than for its own mining, which is not very great. The ores are smelted there, and mining machinery is manufactured. The city is also the centre of a rich stock-rearing and agricultural area which is supplied by irrigation canals with water from the south Platte. There are, of course, scores of mining towns besides these, for not one of the western states is without gold, silver, or copper mines.

Routes of the Western States.—We have already learned that Helena, Cheyenne, Pueblo, Santa Fé and El Paso (the pass), are so situated as to command the five great railway lines which cross the Western States. The three southern lines go to San Francisco, and the northern lines to Portland and Seattle. They can be traced on Fig. 52.

EXERCISES

1. Describe the various methods of gold mining adopted in these states.
2. Compare the Colorado river with the Mississippi with regard to the work each is doing.
3. Compare San Francisco with Los Angeles in as many respects as possible. Why has the latter become the world's greatest film-making centre?
4. Find out about the wonderful Boulder Dam that has been built across the Colorado River. Where is it? Why has it been built?

CHAPTER XXI

THE UNITED STATES: GROWTH, POPULATION AND TRADE

I. HOW THE UNITED STATES ACQUIRED HER TERRITORY

REFERENCE has been made to the comparative ease with which the Spaniards spread northwards from Mexico, and took possession of the south-west portion of the United States. We have also learned that the English settlements were on the east coast, whilst the French occupied the Central Plains, having reached them along the easy route of the St. Lawrence valley. The Treaty of 1763 (see p. 101) not only gave Canada to England, but also the French colonies east of the Mississippi, and the Spanish possession of Florida. When the great struggle between the American colonies and the mother country ended in the victory for the colonists, Florida went back to Spain, so that the portion of the present United States that remained for the colonists was all the land east of the Mississippi excepting Florida. (See Fig. 56.) From this nucleus the present country has grown. In 1803 the remainder of the French possession of Louisiana was purchased for £2,500,000. Sixteen years later Spain sold Florida for £1,000,000. In 1821 Mexico became independent of Spain, and owing to the large number of settlers from the east who made their homes in Texas, that state, which had been part of Mexico, was annexed in 1845. Trouble arose about this and the determination of the boundary, and war with Mexico was the result. The outcome of the war was that Mexico ceded the remaining portion of what had been formerly Spanish territory. This occurred in 1848, and several years later a smaller portion south of the ceded territory was added by purchase from Mexico, the price paid being £2,000,000. There is still the north-west to account for. Claim was laid to this by both Canada and the United States, and the boundary was fixed

in 1812. Disputes occurred, and it was not until 1848 that the 49th parallel of latitude was agreed upon as the international boundary. It is notable that there are neither fortresses nor military works along this great length of frontier.

Alaska was purchased from Russia in 1867. The conclusion of the war between Spain and the United States led to the annexation of the Philippine Islands and Porto Rico in

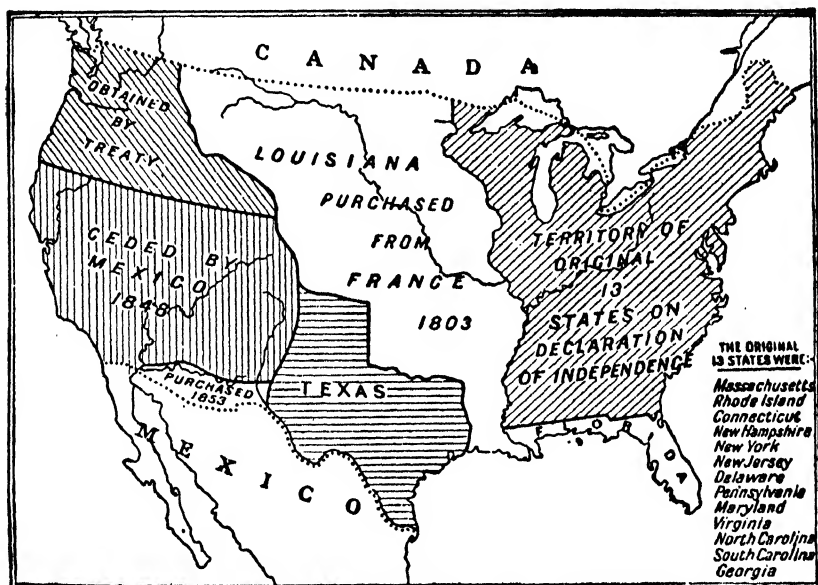


FIG. 56.—How the United States acquired her territory.

1898. The Hawaiian or Sandwich Islands, and some of the Samoan Islands, also form part of the foreign possessions of the United States.

II. THE PRESENT DISTRIBUTION OF THE POPULATION OF THE UNITED STATES

The figures given below show the number of people per square mile in each state at the last census (1930). Trace from an atlas an outline map of the United States and insert the state boundaries. Select a suitable scale and

scheme for shading, and shade each state according to the distribution of its population.

It is evident that in each state the population has to be spread out over the whole area although it may be concentrated in some particular part of the state, as, for example, if a portion of the state is too mountainous to support a dense population. Despite this fault, your map will bring out the following important points—

- (a) That, except Florida, the states east of a line from the north-west corner of Minnesota to the south-western corner of Louisiana, have a much larger population than the states west of this line.
- (b) That the Mountain and Pacific states, except California and Washington, have less than ten people per square mile. The greater proportion of the population in these states is centred round such mining centres as Butte and Denver, and the vicinity of Salt Lake City.
- (c) That the belt of states in the latitude of New York, from the Mississippi to the Atlantic coast, has the densest population.

POPULATION PER SQUARE MILE IN EACH STATE

Maine	26·7	North Dakota	9·7	Mississippi	43·4
New Hampshire	51·5	South Dakota	9·0	Arkansas	35·3
Vermont	39·4	Nebraska	17·9	Louisiana	46·3
Massachusetts	528·6	Kansas	23·0	Oklahoma	34·5
Rhode Is.	644·3	Delaware	121·3	Texas	22·2
Connecticut	333·4	Maryland	164·1	Montana	3·7
New York	264·2	District of } 7,852·7		Idaho	5·3
New Jersey	537·8	Columbia }		Wyoming	2·3
Pennsylvania	214·8	Virginia	60·2	Colorado	10·0
Ohio	163·1	West Virginia	72·0	New Mexico	3·5
Indiana	89·8	North Carolina	65·0	Arizona	3·8
Illinois	136·2	South Carolina	57·0	Utah	6·2
Michigan	84·2	Georgia	49·5	Nevada	0·8
Wisconsin	53·2	Florida	26·8	Washington	23·4
Minnesota	31·7	Kentucky	65·0	Oregon	10·0
Iowa	44·5	Tennessee	62·8	California	36·5
Missouri	52·8	Alabama	51·6		

Note that the full census is made every 10 years and that these figures are for the census of 1930.

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INCREASE IN POPULATION FROM 1790 TO 1930

Year.	Total Population.	Year.	Total Population.
1790	3,929,214	1890	62,947,714
1810	7,239,881	1910	91,972,266
1830	12,866,020	1920	105,710,620
1850	23,191,876	1930	122,775,046
1870	38,558,371		

THE ORIGIN OF THE FOREIGN WHITE POPULATION 1930 CENSUS

Ireland . . .	3,782,521	Canada . . .	3,337,345
England . . .	2,522,261	Russia . . .	2,669,838
Scotland . . .	899,591	Sweden . . .	1,562,703
Wales . . .	236,667	Norway . . .	1,100,098
Total for British Isles . . .	7,441,040	Austria . . .	954,648
Germany . . .	6,873,103	Hungary . . .	590,768
Italy . . .	4,546,877	Other countries . . .	6,308,975
Poland . . .	3,342,198		
		Total . . .	38,747,593

The most interesting points to notice are the large number of people now in the United States who are of British, Canadian, German, Italian, Polish and Scandinavian stock. At the census of 1930 nearly one-third of the population was of foreign stock. So many people from Europe wish to make homes in the United States that arrangements have had to be made to restrict their number and to fix the quota allowed in each month from each country.

SOME CITIES WITH MORE THAN 500,000 INHABITANTS

City.	Population.		
	In 1830.	In 1890.	In 1930.
New York . . .	197,112	1,515,301	6,930,446
Chicago . . .	4,470 (1840)	1,099,850	3,376,438
Philadelphia . . .	80,462	1,046,964	1,950,961
Cleveland . . .	1,076	261,353	900,429
St. Louis . . .	14,125	451,770	821,960
Boston . . .	61,394	448,447	781,185
Baltimore . . .	80,620	434,439	804,874
Pittsburg . . .	12,568	238,617	669,817

TRADE FIGURES, YEAR ENDING 30th JUNE, 1930

[Statistics for 1930 are retained for the present because they are more typical of the trade of the country than those for the few following years, which show the effect of the world-wide economic depression from which the United States suffered very acutely. Compare the figures for 1930 and 1935 in the table on the next page. Even 1935 represents a great improvement upon 1933.]

Type of Merchandise.	Imports.		Exports.	
	Million Dollars.	Per cent.	Million Dollars.	Per cent.
<i>Raw materials</i> for use in manufacturing .	1,309	34·0	1,031	22·3
<i>Foodstuffs</i> (unmanufactured) and food animals .	479	12·5	218	4·7
<i>Foodstuffs</i> (partly or wholly manufactured) .	358	9·3	440	9·5
<i>Manufactures</i> (partly completed) .	785	20·4	637	13·8
<i>Manufactures</i> (ready for full use) .	918	23·8	2,293	49·6
Totals	3,849	100·0	4,619	100·0

These figures are most illuminating. You should have no difficulty in stating the articles included in the various headings, e.g. raw cotton comes under the *exports* and rubber under the *imports* under the first heading; parts of motor cars come under the fourth heading and completed cars under the last heading. Notice that the United States *exports* more manufactured articles than foodstuffs and raw materials, and that her chief *imports* are raw materials used in her vast manufacturing industries.

THE CHIEF COUNTRIES WITH WHOM THE TRADE WAS CARRIED ON, YEAR ENDING 30th JUNE, 1930

Countries.	Value in million dollars of imports from	Value in million dollars of exports to
Canada	475·1	817·0
United Kingdom	280·8	784·4
Germany	224·4	363·2
Japan	366·2	229·6
France	150·0	253·8
Argentina	108·0	173·7

Before the Great War the chief importer into the United

THE UNITED STATES: TRADE FIGURES 155

States was Great Britain. The above figures show that Canada has taken the place of the mother country.

The following table illustrates another change in American important trade. Since the Great War there has been a remarkable falling off in the relative share of Europe and a very high increase in the shares obtained by Asia and Africa.

TRADE OF THE UNITED STATES

Continents.	Imports in millions of dollars.			Exports in millions of dollars.		
	1924.	1930.	1935.	1924.	1930.	1935.
Europe . . .	1,170	1,188	599	2,660	2,173	1,028
Asia . . .	1,048	1,096	604	457	566	377
North America .	960	880	494	1,142	1,242	531
South America .	495	557	281	360	436	174
Africa . . .	84	88	41	77	116	96
Oceania . . .	65	40	26	167	160	73

EXERCISES

1. Compare the foreign-born white population in the United States with that of Canada (see p. 104).
2. Represent the exports and imports in suitable graphical form. Select a method that will make the differences between the character of the export and import trade stand out very clearly.
3. "The United States is the America of achievement, and Canada the America of opportunity." Discuss this statement.
4. Briefly describe and account for the general distribution of the population of the United States. Which is the busiest manufacturing section?
5. Can you account for the remarkable changes shown in the last table given above? Represent these statistics graphically.

CHAPTER XXII

LATITUDE AND LONGITUDE: LONGITUDE AND TIME

LATITUDE

WE mention these words so frequently that it is well to devote some time to see what they really mean. On wall maps and atlases you will be quite familiar with the two sets of lines which form the map-network. Those which cross the map from east to west are lines of Latitude, and those which run from north to south are lines of Longitude. Examine a globe, and you will see that every line of latitude is a circle. The greatest circle is the equator, and all the others are smaller and smaller as the poles are approached. Each circle has as its centre, a point on the earth's axis, and since all the circles are parallel to each other, they are spoken of as parallels of latitude. The equator is numbered 0, and the others from 1 to 89, the poles being points numbered 90. Now latitude is an angular measurement. If one line be drawn from New York to the centre of the earth, and another from a point on the equator, in the longitude of New York to the centre of the earth, the angle made by these lines will be one of 41° (see Fig. 57); so you can see that latitude is measured by angles, not in miles. The distance along a line of longitude subtended by an angle of 1° at the centre of the earth is about 69 miles, being rather less nearer the equator than near the poles, owing to the flattening in Polar regions.

LONGITUDE

Lines of longitude are all great circles passing through the poles. The only great circle of latitude, or circle as large as any drawn on the earth can be, is the equator. The line passing through Greenwich is numbered 0, and is known as the Prime Meridian, although any line may be so numbered. The longitude of New York is 74° W., and this means that the angular distance from New York is 74° W. of Greenwich.

(See Fig. 57.) The distance along the equator subtended by an angle of 1° at the centre of the earth is about 69 miles, which is the same as a degree of latitude. But as the poles are approached a degree of longitude decreases, for all lines of longitude, or meridians, meet at the poles. The meridians are numbered from 0 to 180, east and west of Greenwich, the meridians 180° W. and 180° E. being, of course, identical. If we know the latitude and longitude of a town we can easily find its exact position on the map, for since New York is in latitude 41° N. and longitude 74° W., it must be at the intersection of these lines.

LONGITUDE AND TIME

You will be quite familiar with the fact that the sun rises in the east and appears to move across the sky through the south and sets in the west, and you will probably know that it is the earth's rotation from west to east which gives this appearance. The east coast of North America is in the sunlight before the west coast. New York, or any other city, should call its time 12 o'clock noon when the sun is in the south, or at its highest, in that city. Places east of New York have noon earlier, and places west later than that city. The earth makes one complete revolution on its axis, or turns through 360° , in twenty-four hours, which is equal to 15° in an hour or 1° in four minutes. Therefore a city 15° E. of New York would have its noon one hour earlier, and a city 15° W. of New York would have its noon one hour later than New York. North America is so large that it would be absurd for San Francisco to take the same time as New York, for the former

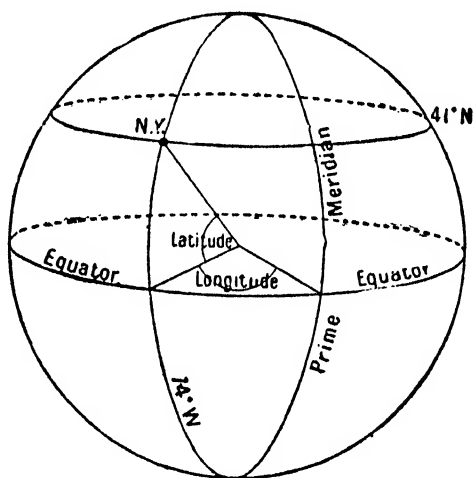


FIG. 57.—Diagram showing latitude and longitude as angular measurements.

place would be calling the time 12 o'clock noon when sun noon would not occur for three hours later. If all the cities of North America had their own noon when the sun was highest at each particular place, there would be the greatest confusion, and such things as railway time-tables would be exceedingly difficult to follow. Since the time changes one full hour for 15° of longitude, the United States and Canada take each meridian divisible by 15° as a central meridian, from which all the towns situated within a belt $7\frac{1}{2}^{\circ}$ on each side of the central meridian, take their time. This would be the ideal scheme, but it is not exactly adhered to, for in many cases the meridians cross almost uninhabited districts, or a meridian may give two times for a compact, well-peopled area, so that adjustments are made, but chiefly for railway convenience. If you were to travel by railway across the United States from New York to San Francisco, you would find that the times are changed at one of the great cities in each belt. Leaving New York at 4 p.m. eastern time, it would be necessary to put back your watch one hour upon arriving at Pittsburg in order to be right with central time, and this would be repeated at Cheyenne, and again upon arrival at San Francisco.

You will appreciate what a great deal of annoyance and confusion are saved by the use of time belts; but you must notice that the standard time is only correct for such places in each belt which happen to be situated on the central meridian, and that for all others, the standard time is incorrect. Fig. 58 gives the name by which each of the time belts is known. You will observe that Canada has one more belt than the United States, the Colonial time belt, which is four hours behind Greenwich time. Newfoundland has not come into line with this arrangement for standard time, but takes its time—3 hrs. 30 min. 44 secs. behind Greenwich—from St. John's, the capital. That is, when the clocks in England give the time at 12 noon, Newfoundland clocks show nearly 8.30 a.m.

Besides Canada and the United States, Australia, Europe, and many countries in other continents, have also adopted standard time, whilst the British Navy keeps standard time at sea. In South Australia the time is taken from $142\frac{1}{2}^{\circ}$ E., which gives $9\frac{1}{2}$ hrs. ahead of Greenwich. This is due to the

fact that the population centre is nearer that meridian than the 135° E., for this one passes through an almost uninhabited area. Australia takes time from the meridians 120° , $142\frac{1}{2}^{\circ}$, and 150° east of Greenwich.

It is very interesting to notice that if a traveller goes round the world westwards without altering his watch, he finds on completing his journey that he has lost a day, whilst if his

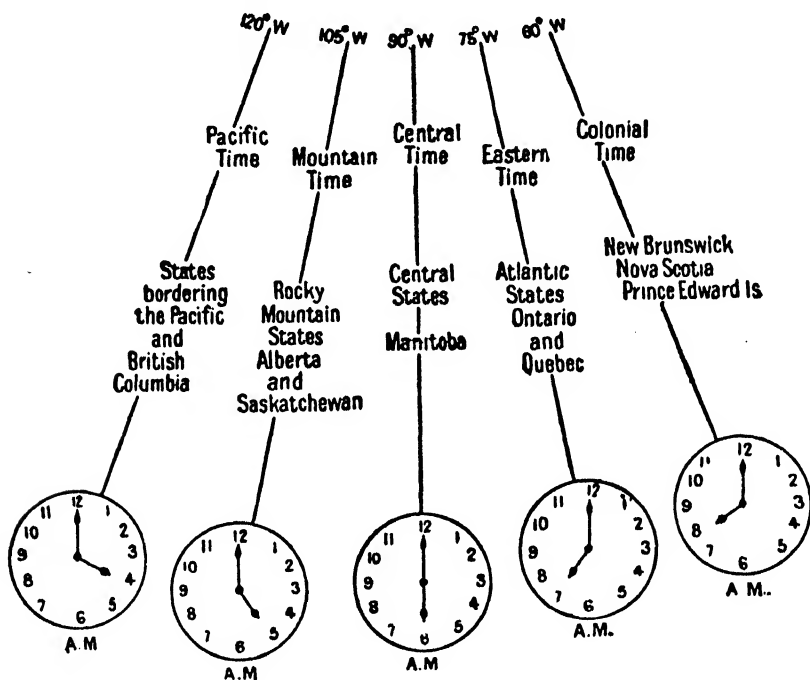


FIG. 58.—Diagram to illustrate the divisions of Canada and the United States for the purposes of time. The clocks show the time when it is noon at Greenwich.

journey is eastwards he has gained a day. If it were possible for him to travel westward as fast as the sun, and he set out on his journey, say at noon on Saturday, there would be no change in his time, yet somewhere Saturday must end and Sunday commence. Were he to travel eastward at the same rate he would meet the sun in long. 180° E., and it would apparently be noon on Sunday for him. If he approached the meridian from the west it would be noon on Saturday. Again, when the time at Greenwich is 9.0 a.m. on Monday, it

is 3.0 a.m. Monday in long. 90° W., and 9 p.m. Sunday in long. 180° W. When it is the same time at Greenwich it would be 3 p.m. Monday in long. 90° E., and 9 p.m. Monday in long. 180° E. But 180° E. and 180° W. are the same, although if approached from the west, it is 9 p.m. Sunday, and if approached from the east 9 p.m. Monday. It is therefore very necessary that a line should be drawn somewhere on maps where it is convenient to get these dates straight. In all probability it will be found marked on an atlas map of the Pacific Ocean or of Australasia. It follows the meridian 180° , excepting for one or two deviations which are made in order to suit the convenience of certain islands which lie very near to the meridian. If a ship approaches the line from the west on a Saturday, the next day is called Monday, whilst if the line is approached from the east, Saturday is repeated.

Alaska was discovered by Russians who journeyed eastwards, and until that land was purchased from Russia by the United States, was a day in front of the rest of America in time. The Philippines, for very many years, were a day behind surrounding islands, for they were discovered by Magellan who sailed westwards. Magellan was killed in these islands, but the ship continued its journey under Sebastian del Cano, and great was his astonishment to find, on arrival at Spain, that a day had been lost (see p. 178).

EXERCISES

1. Explain carefully what is meant by the statement that the latitude and longitude of New Orleans are respectively 30° N. and 90° W.
2. Explain why it is that during the Australian cricket season, London morning newspapers give the results of play up to the close at 6 p.m. on the same day.
3. When it is (a) 9 a.m. at Greenwich, what time is it in New York ?
(b) 8 p.m. in Chicago, what time is it in New Orleans ?
(c) 10 p.m. Monday, in the Mountain Time Belt, what time is it in London ?
(d) 6 a.m. in Halifax, Nova Scotia, what is the time in Berlin (time taken from 15° E.) ?
4. What is meant by Standard Time ? Illustrate your answer by reference to the time belts of the United States.
5. Study the train time-tables given on page 99. What would be the difference in time at each place between your watch and the local time if your watch were not altered after leaving Halifax or Montreal ?

CHAPTER XXIII

MEXICO

Area, 767,200 sq. miles.

Population, 16,404,030 (1930 Census): one-sixth white, one-third Indian, one half mixed.

THE high plateau enclosed by the eastern and western Sierra Madre is a continuation of the plateaus further north, and in many respects resembles these very much indeed. Bordering the coasts are narrow plains, broader, however, on the east coast than on the west. The Gulf of California is the drowned lowland between the western Sierra Madre and lower California, which is a continuation of the coast range of the United States. North America ends at the Isthmus of Tehuantepec; but politically included in Mexico is the low limestone plateau of Yucatan, and the northern extremity of the mountains of Central America. (See Fig. 59.) To the south of the plateau there is a volcanic range of mountains, which runs from west to east. In this range are such giant volcanoes as Orizaba (18,314 ft.), and Popocatepetl (17,880 ft.).

Mexico lies in the track of the N.E. trade winds, so that the east coast receives more rain than the west coast. As regards temperature, owing to its nearness to the equator, for the southern half of the country is within the tropics, the coastal plains are hot in winter, and very hot in summer. The plateau, as we should expect, is much cooler than the plains. These climatic facts may be illustrated by the following rainfall and temperature figures—

MEAN MONTHLY RAINFALL, IN INCHES

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Total for Year.
Colima . . .	0.5	0	0	0	.7	6.8	7.1	6.7	7.4	4.1	0.5	0.3	34.1
Mexico City . . .	0.2	0.2	0.6	0.6	1.9	3.9	4.1	4.7	4.1	1.8	0.5	0.1	22.7
Vera Cruz . . .	0.4	0.5	0.6	0.2	4.3	12.5	14.8	8.9	11.6	9.0	3.2	2.0	68.0

MEAN MONTHLY TEMPERATURE, IN DEGREES FAHR.

	Height above sea-level.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Average for Year.
Colima . .	Feet. 660	69	70	74	77	81	81	79	79	78	77	73	72	76
Mexico City .	7,474	54	57	60	64	65	64	63	62	61	59	56	54	60
Vera Cruz .	0	72	73	75	79	81	81	82	82	80	76	75	71	77

Find the positions of these towns on the map. It is evident that considerably more rain falls in these places in summer than in winter. This is true of the whole country.

There are no important navigable rivers in Mexico, for the rapid descent from the plateau to the plains makes them useless for navigation. The plateau rivers suffer very much from lack of water, and many of them never reach the sea. This lack of navigable waterways has very considerably hindered the development of the country.

Three well-marked climatic belts are found in Mexico, Central America, and the north-western regions of South America. They are (1) the Tierra Caliente, or Hot Lands, (2) the Tierra Templada, or Temperate Lands, (3) the Tierra Fria, or Cool Lands.

In Mexico the hot belt comprises the coastal plains, which are often very unhealthy, and the slopes of the mountains below 3,000 feet. The wetter parts of this belt are densely forested with tropical trees, such as palms, rubber, mahogany, etc., whilst many tropical fruits, such as bananas and pine-apples, grow wild. The lower lands are also noted for the cultivation of cotton, rice, sugar and cacao. On the lower slopes of the mountains, maize, tobacco and coffee are grown.

The temperate belt is below a height of about 7,000 feet, and includes a considerable portion of the plateau. The climate is one of perpetual spring. Wheat, corn, beans, and temperate fruits can be grown where irrigation is practised, as in the district round Mexico City, which in this respect may be compared with Salt Lake City. The water for irrigation is supplied by the snow and rain which fall among the neighbouring mountains. The cactus is very common, and often grows to considerable dimensions. One species known as the *agave* is cultivated for its milky juice, which is made into *pulque*, the commonest drink in Mexico. The thick leaves,

like those of another similar plant, have a fibre which is a rival of jute. This fibre is known as *henequen*, or sisal hemp, and forms the chief product of Yucatan. Apart from the cultivated lands, there are large areas where irrigation cannot be practised, but nevertheless are suitable for the rearing of cattle, horses, mules, sheep and goats. Owing to the very slight rainfall, more than half of the plateau, especially the north-west, is of no value even for pastoral occupations.

The cool lands are above an elevation of 7,000 feet, and contain splendid forests of pines and firs.

Mining.—One of the most important occupations in Mexico is mining, as the country is exceedingly rich in minerals. You will remember that it was partly from Mexican mines that the Spaniards obtained great supplies of gold and silver. The most important mineral is silver, which is mined in nearly every state in Mexico. The best known towns engaged in silver mining are Guadalajara, Zacatecas and San Luis Potosi. Copper, gold, lead, iron, coal and petroleum are also important mineral products. Owing to the great increase in the use of petroleum, the Mexican supplies have become extremely important, and the production increased from two and a half million barrels in 1909, to fifteen and a half million barrels in 1912, and 194 million in 1921. Since 1921, however, the production has steadily fallen to forty million barrels in 1935. The chief petroleum deposits are in the neighbourhood of Tampico.

ROUTES, CHIEF CITIES, ETC.

The plateau is reached from the United States by two main railway lines (Fig. 59). From El Paso, on the Rio Grande, one line runs southwards through Zacatecas, and before reaching Mexico City is joined by another which serves the eastern plateau and passes through Saltillo and San Luis Potosi. Mexico City is also joined by railway to its port, Vera Cruz, as well as to the chief ports on the west coast. The low isthmus of Tehuantepec is also crossed by a railway.

The capital, *Mexico City*, is also the largest town. Its population is estimated to exceed one million. It is in the south of the central plateau, shut in by mountains, at an elevation of about 7,500 feet above sea level. It is surrounded by the best cultivated area in the country, in contrast to which the giant volcanoes to the south of the city stand out in bold

relief. The city is built on the site of the old capital of the Aztecs. Guadalajara, St. Luis Potosi and Zacatecas have been referred to as important centres for silver-mining. Pueblo, south-east of Mexico City, is situated near to an ancient Aztec town, or pueblo, and is an industrial centre. On the east coast, the chief ports are *Tampico* and *Vera Cruz*. Both these ports are situated on the low-lying, unhealthy, coastal plains



FIG. 59.—Map of Mexico. Areas over 1,200 feet are shaded.

and have poor harbours, upon which large sums of money have to be spent in constructing breakwaters. *Mérida* and *Campêche*, in Yucatan, export henequen. On the west coast *Mazatlan* and *Acapulco* have the best harbours.

Mexico obtained her independence from Spain in 1821. Since then the country has been governed either as a kingdom or empire, or as a republic. At present it is a republic whose government is modelled on the lines of that of the United States, but it is not by any means so peaceful or as well governed as that neighbouring republic. The country is not in a very advanced state. Its agriculture is generally carried on by the most primitive methods, whilst most of the mines

are owned by foreigners. This can easily be understood in a country where one-third of the people are Indians, half are of mixed race, and only one-sixth are whites.

The part of Mexico which is most densely peopled is the southern plateau, which, owing to its altitude, has a temperate climate. This is the most important agricultural area in the country. The houses of the poor people are often wretched, for most of them are built of sun-dried clay and straw bricks, or adobes, and very often a house contains only one room. In the large cities, however, there are many splendid buildings, especially cathedrals, most of which were built by the Spaniards. The Cathedral of Mexico, Mexico City, was begun in 1573 and not completed until 1811. It is a magnificent building, and is built on, or close to, the site of an old Aztec temple destroyed by Cortes in 1521. The Mexicans, like the Spaniards, are mainly Roman Catholics.

EXERCISES

1. Compare the climates of the Pacific coast, the plateau and the Atlantic coast of Mexico.
2. Using your physical atlas map of Mexico, construct a section across the country from west to east.
3. Mexico is to-day the most backward country in North America, although at the time of the discovery of the continent, its inhabitants were the most progressive. Can you give reasons for this?
4. Give examples of the close connections between elevation, climate and vegetation in Mexico.

CENTRAL AMERICA AND THE WEST INDIES

PHYSICAL FEATURES

OPEN your atlas at the physical map of Central America and the West Indies and examine it in connection with Fig. 60. Central America extends from the Isthmus of Tehuantepec to the Isthmus of Panama, and occupies an exceedingly important position between the Atlantic and Pacific Oceans. Although it is an isthmus joining North and South America, its connection with these continents was made in recent geological times.

In the large island of Hispaniola three distinct mountain ranges can be traced. The northern range is connected by submarine ridges through the highlands of north-west Cuba to the limestone plateau of Yucatan. The central range is represented in Cuba by the Sierra Maestra, which in turn is connected with British Honduras by a submarine ridge on which stands the island of Grand Cayman. The southern ridge of Hispaniola can be traced through Jamaica to Honduras. In the island of Porto Rico the three ranges of Hispaniola form one highland mass.

Thus it will be seen that Central America is very intimately connected with the large islands which make up the group known as the Greater Antilles. Indeed, Central America and the West Indies are the remains of an ancient continent, which formerly extended much farther west than at present, and farther east than the ridge on which stand the West Indies. The West Indies have been separated from Central America by subsidences which allowed the water of the Atlantic Ocean to form the Caribbean Sea.

CENTRAL AMERICA

PHYSICAL FEATURES

Look again at the physical map of Central America, and notice that there is a belt of high ground running very closely to the west coast and parallel with it. This is volcanic, and contains peaks nearly three miles high. To the east of the volcanic belt and between the Tehuantepec and Guatemala

narrows, the low plateau of Yucatan points northwards. This has already been described in connection with Mexico. Between the narrowing in Guatemala and that in southern Nicaragua are ranges which run east and west, making the isthmus very broad along the boundary between Honduras and Nicaragua. There is a further narrowing at the Isthmus of Panama. These narrowing points are of considerable importance to trade. A railway crosses the Isthmus of Tehu-

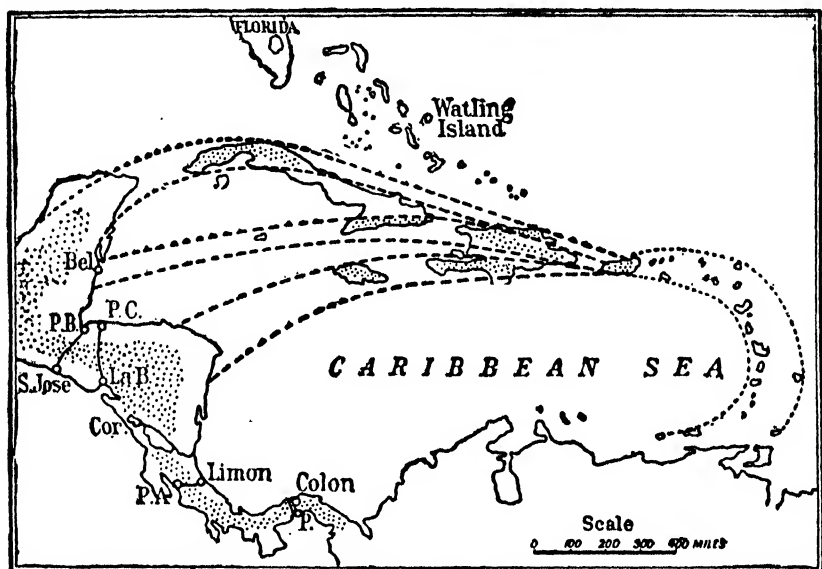


FIG. 60.—This diagram illustrates the former connection which existed between the Greater Antilles and Central America.

antepec (Fig. 59); and it is interesting to notice that it is cheaper to send goods from New York to San Francisco by steamer, rail and steamer, despite the charges at the isthmus for unloading and reloading, than it is to send them on the transcontinental railways. The Isthmus of Tehuantepec is about 130 miles broad, and is not very high, whilst the second narrowing in Guatemala is half as wide again, and is a much more difficult barrier to cross. Nevertheless it is crossed by two railway lines (Fig. 60). The narrowing in southern Nicaragua is about 150 miles across, and it was once proposed to utilize it for a canal, making use of the river San Juan canalized, and Lake Nicaragua.

The Panama Canal.—The fourth narrowing is at the Isthmus of Panama, where the canal which has been made by the United States is situated. Here it is under forty miles from the Atlantic to the Pacific. Fig. 61 shows that the canal has been constructed from Colon to Panama. The chief difficulty in making it was the cutting through of the Culebra Hill. Great quantities of earth constantly slid into the cutting and hindered the work considerably. Unfortunately, even since the canal has been completed, slides of earth have taken place. Boats ascend by three locks near to Colon and descend by three locks at the Pacific end, the

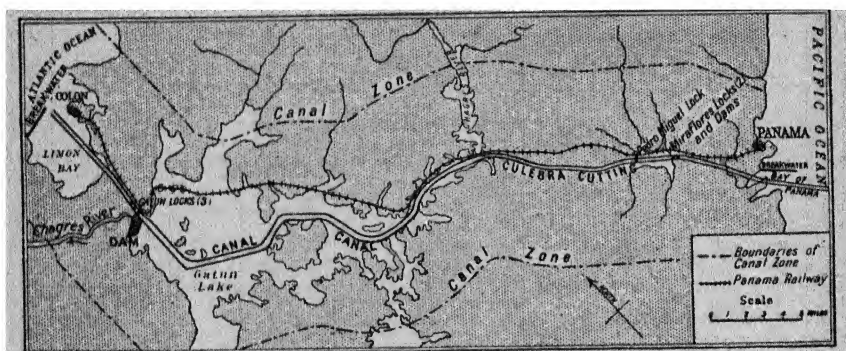


FIG. 61.—Map of the Panama Canal. Water surfaces are not shaded.

bottom of the canal between the locks being forty feet above sea level. Notice the artificial Gatun Lake which has been made by placing a dam across the River Chagres. The French were the first to attempt the making of a canal across the isthmus, but abandoned the project largely owing to the ravages of tropical diseases and fever. The Republic of Panama, through whose territory the canal is constructed, sold a belt of land five miles on each side of the canal to the United States, and one of the first tasks was to render the area suitable for a large number of workers to live in, as the climate was very unhealthy. This was accomplished by skilful attention to drainage, water supply and sanitary matters generally.

A map of the world shows that the canal very considerably shortens steamship routes from New York and the other eastern and gulf ports of North America to the chief ports of western North and South America. The journey between

New York and San Francisco is shortened by nearly 9,000 miles, and that between Liverpool and other West European ports and San Francisco by 6,500 miles.

The distances between Atlantic and Gulf ports and Australasia, China and Japan are also less via the Panama Canal than by the shortest possible alternative route. It is not likely that the Panama Canal will take from the Suez Canal much of the trade between European ports and eastern Asia and Australasia, for the Suez route is shorter; but it is important to note that it gives New York and the manufacturing New England States a much shorter journey to Japan and Australia (not to China) than that from the chief West European ports via the Suez to these places. 2,892 vessels passed through the canal in 1921; 5,180 in 1935.

CLIMATE AND VEGETATION

Reference to an atlas will show that the whole of Central America lies between the equator and the Tropic of Cancer, so that its prevailing wind is the north-east trade. From this it follows that more rain will fall on the east coast or windward side, than on the west coast, or leeward side. Except in the elevated regions, where it is reduced, the mean annual temperature is high. It should be noticed that more rain falls in summer when the sun is overhead north of the equator, and that although at that time of the year the temperature is higher, there is not very much difference on the coastal lands between summer and winter owing to nearness to the equator.

On the eastern plains, owing to the heat and rains, there are forests and jungles, the coast-lands being malarial and very unsuitable at present for cultivation and occupation by man. Therefore, the majority of the inhabitants live either on the high plateaus where grass-lands are found and pastoral occupations are largely followed, or on the drier west coast. As in Mexico, the Tierra Caliente (from sea level to about 3,000 feet), the Tierra Templada (3,000 to 7,000 feet) and the Tierra Fria (above 7,000 feet) are well marked. In the first belt the chief products of the forests are rubber, and such valuable woods as mahogany and logwood, whilst such tropical fruits as cacao, bananas and pineapples are cultivated and exported.

The second belt is forested on the wetter east, whilst on the west coast it is mainly a grass-land with scattered patches of trees. Pastoral occupations are carried on, and the chief cultivated product, and the most important export, is coffee. In the third belt there are extensive areas suitable for pastoral pursuits and for the growing of grain.

POLITICAL PARTITION

If you refer once more to the atlas, you will see that there are six independent republics and a British possession (British Honduras) in this small area. Guatemala is commercially the most important of the republics, selling more produce to foreign countries and buying from them more than any other state. Salvador, though the smallest country in America, is the most densely peopled of the Central American republics. In this connection notice its position. The largest cities are Guatemala (120,000), San Salvador (88,000) and Managua, the capital of Nicaragua (33,000). The inhabitants of Central America are mainly Indians, Spaniards, or half-breeds, and owing to the very backward condition of most of the people, manufacturing is unimportant.

THE WEST INDIES

PHYSICAL FEATURES

1. *The Greater Antilles*.—These consist of the large islands of Cuba, Hispaniola, Porto Rico and Jamaica. Refer to Fig. 60 again and revise what we have learned about their former connection with Central America.

2. *The Lesser Antilles*.—These represent the tops of a submerged ridge, and stretch from Porto Rico to Trinidad, which is a portion of South America detached from the main mass. Notice what an island-protected fringe the Caribbean Sea has. Can you picture to yourself what the West Indies and the surrounding seas would look like if the waters of the seas were removed? The Lesser Antilles may be classified in two ways. The northern islands are known as the Leeward Islands, and the southern ones as the Windward Islands. A better classification is according to their formation. If you examine your map carefully you will see that there are two chains of islands—an eastern and a western. The eastern islands are made of limestone, whilst those to the west are of volcanic

origin. Observe the peculiar outline of the French island Guadeloupe. Its eastern half is limestone and its western half volcanic. Violent eruptions are not uncommon in these islands, the most important in recent years being Mont Pelé (Martinique), and La Souffrière (St. Vincent), which took place in 1902.

3. *The Bahamas*.—What is the position of the islands with regard to the Tropic of Cancer? They stand on a submarine continuation of the limestone peninsula of Florida. There is a very large number of islands in this group—about 3,000—and they are composed of coral. The waters of the Gulf Stream, a warm ocean current which issues from the Gulf of Mexico between Florida and Cuba, sweep over the submarine banks on which they are built. In these warm waters the tiny coral polyps can live and build reefs. The action of the waves has brought the coral particles together and formed them into bars, the coral sand has been blown by the wind, and thus dunes have been made and islands formed. The Bahamas were at one time a centre for buccaneers.

CLIMATE

Like Central America, the West Indies, with the exception of the northern islands of the Bahamas, lie within the Tropics. As they are islands their climate will be more equable than that of Central America. There is very little difference of temperature between the hottest and the coolest months, and the seasons are more distinguished by difference of rainfall, considerably more rain falling in summer than in winter. The prevailing winds are the North-East Trades, and the windward slopes of all the islands receive most rain.

VEGETATION AND PRODUCTS

As most of the islands are mountainous, many types of vegetation are to be found. Fig. 62 shows a view in the island of St. Lucia. Notice the vegetation. Forests are plentiful, especially on the wetter windward slopes; in the largest islands these forests are very extensive, and cabinet and dye woods, and tropical fruits, such as bananas, coconuts and pineapples, are of considerable importance. One of the most interesting trees found in the West Indies, especially in Cuba, is the royal palm. All parts of the tree—

trunk, leaves, fibres and seeds—are of value to the inhabitants. Sugar, cacao, coffee and tobacco are cultivated in most of the islands. Indeed, every temperate and tropical crop can be produced. Sugar is the most important product, although owing to the increased production of sugar-beet in Germany, Holland, Belgium and northern France, the trade with Europe has very largely declined. Cuba exports most sugar, about 25 per cent. of the world's supply, and sends it chiefly to the United States. This island, whose chief town

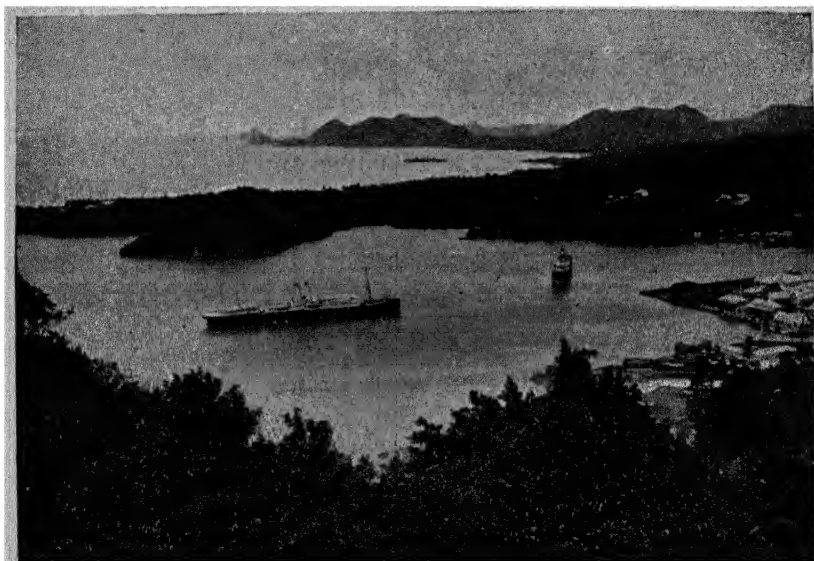


FIG. 62.—The Harbour. Castries, St. Lucia. Notice (i) the hilly nature of the island, (ii) the forests.

and port is Havana, also produces great quantities of tobacco. Jamaica exports bananas and other fruits, coffee, spices and tobacco. Its chief town and port is Kingston whose importance has been increased by the making of the Panama Canal. The chief straits used by steamers in entering the Caribbean Sea from the Atlantic are the *Windward Pass*, between Cuba and Haiti, and the *Mona Pass* between Haiti and Porto Rico. Jamaica is excellently situated with regard to the former. In Trinidad there is a great pitch lake from which asphalt is derived. Asphalt is an almost solid substance formed when petroleum deposits are exposed to the air. It is used for paving. In the Bahamas henequen and

pineapples are grown, whilst sponge-fishing and turtle-catching also find occupation for many people.

Formerly, by virtue of discovery, all the West Indies belonged to Spain, but to-day not one island is Spanish. Jamaica was the first to be lost, for it became a British possession in the days of the Commonwealth, and it has remained so ever since. Besides Jamaica, the whole of the Bahamas, and most of the Lesser Antilles are British. You can easily find out from your atlas which islands in the Lesser Antilles are owned by France, Holland and the United States. As a result of the war between the United States and Spain in 1898, Porto Rico became a possession of the United States, and Cuba an independent republic. Hispaniola consists of two independent negro republics, Haiti and San Domingo, the former showing the influence of French occupation in so far as it is French-speaking, whilst the latter is Spanish-speaking. The island is in a very backward condition, and altogether it cannot be claimed that the experiment of native-controlled republics has been a success, for the inhabitants are too indolent to take full advantage of the natural fertility of their land.

BERMUDA

Although not part of the West Indies, this is the most appropriate place to mention the group of small islands some 600 miles east of North Carolina, known as *The Bermudas*. Their total area is only about 19 square miles. Like the Bahamas they are composed of coral, and it is interesting to notice that they are among the very few coral islands outside the tropics. This is due to the fact that their shores are washed by warm ocean currents which give the necessary mean annual temperature of not less than 70° F. required for the growth of coral polyps. The foundations of the Bermudas are laid on a volcanic cone standing up from the bed of the ocean. Such a foundation is necessary, because the tiny coral polyps cannot live in deep water. The Bermudas are noted for their splendid climate, for the winter is never cold, neither is the summer heat oppressive. This, of course, is due to the influence of the sea. The excellence of the climate is reflected in the fact that every year large numbers of Americans spend their holidays in the islands.

the approximate position of this line. You will see that it gave some of South America to Portugal, although of course, at that time, none of this had been discovered. Six years later, in the year 1500, Cabral, in making a voyage from Portugal to the Cape, took a great bend westwards and discovered that there was land within the Portuguese sphere of influence. Of course, he had reached Brazil. He sent the news to Portugal, and *Amerigo Vespucci*, who had made his first two voyages in the service of Spain, and had become noted, was invited to take charge of the expedition to explore the new land. This has been dwelt upon at length because we shall see later that this line of demarcation had important influences upon the future of South America. It is interesting to notice that this voyage may be almost reconstructed by studying the names which were given to various topographical features. The method seems to have been that of giving the feature for which a name was desired, the name of the saint for the day. Examine Fig. 63, and you will find a selection of places with the dates appended. The name Rio de Janeiro is probably of later origin.

Having made four voyages to the mainland of South and Central America, Vespucci could not fail to recognize that it was a new continent which had been reached by Columbus. The animals, plants and people were very different from those of the old world. The continent was first named after Vespucci by a German professor named Waldseemüller, who published in 1507 "An Introduction to Cosmography," in which he included Vespucci's letters and suggested that the new land should be called America, although at first the name applied only to that portion which he had visited. The unfolding of the east coast of South America was continued by Juan Díaz de Solís, who reached the mouth of the Plate River whilst in search of a passage to the East Indies. It was on the banks of this great river that he was killed by the natives.

In 1513 *Nuñez de Balboa* crossed the Isthmus of Panama, and was the first European to see the Great Pacific Ocean which he called the "South Sea," as he thought it lay off the south coast of Asia. A few years later, on September 20th, 1519, *Ferdinand Magellan*, a Portuguese sailing for the Spaniards, set out on his great journey. Arriving at Brazil, his ships slowly coasted along the east of South America. He

had great difficulty in controlling his very mixed crew, but succeeded in quelling rebellions with a firm hand. The name *Patagonia* was given by Magellan. It means "broadfooted," and was given before he had seen any of the native Indians, from the impressions which he found in the sand. On October 21st, 1520, he passed through the strait which now bears his name, and was the first navigator to sail the ocean which he named the Pacific on account of its calmness. The name does not by any means describe this ocean. It took him thirty-eight days to get through the Magellan Straits, and for another hundred days he steered north-west before touching the Ladrone Islands. These were days of great suffering from lack of food and water, for they had no idea of the vastness of the ocean separating America from Asia. Only one ship got back to Spain after an absence of three years. It was captained by *Sebastian del Cano*, for Magellan was killed in a native fight in the Philippine Islands.

We have learned something about the influence of longitude on time. You will see that, as Magellan's ship was the first to sail right round the world, the sailors would find that they had lost a day when they once more got back to Spain. This accounts for the story that instead of being received in great triumph when they reached Seville, they had to crawl through the streets in sackcloth and ashes for having kept festivals and fasts on the wrong days during the time they had been away.

Whilst Magellan had been undertaking this epoch-making journey, the Spaniards had not been idle in Mexico, Central America, and the West Indies. After the visit of Balboa to the Isthmus of Panama, stories of lands to the north and south, inhabited by great nations whose wealth was fabulous, were common. We have already seen (p. 7) that Hernando Cortes was despatched from Cuba to investigate these stories as regards Mexico, and that his conquests and discoveries opened up new lands in Mexico and Central America. Another Spaniard, *Francisco Pizarro*, investigated the stories of the El Dorado to the south. With a companion, Diego de Almagro, he made coasting voyages along the north-west coast of South America and heard of the great empire on the plateau of Peru. Obtaining some gold and silver, he returned to Spain to get the permission of Charles V for the conquest

of Peru. This was given on the usual terms, viz., that the monarch should receive one-fifth of all the spoils. Setting out with a small force of less than 200 men, he followed the policy of Cortes and made at once for the capital, Cuzco. He captured Atahualpa, the Inca emperor, who offered to pay a huge ransom. This was paid, but Atahualpa was nevertheless put to death, and his country, together with its great riches, became part of the Spanish possessions.

Something has already been learned of the ancient Aztec civilization destroyed by Cortes and his successors. On the plateau of Peru and Bolivia, Pizarro found an even more advanced type of civilization. The Incas had built many great cities, the chief being Cuzco, from which excellent roads led to all parts of the empire. Splendid bridges carried these roads across rivers and gorges, beautiful temples and palaces adorned their cities, whilst aqueducts were built to supply the inhabitants and the fields with water. Their chief occupation was agriculture, and they grew more maize than is now produced. Wool was obtained from their flocks of alpacas and llamas, and beautifully designed cloths were woven by the women. Many of these temples, aqueducts, etc., remain even to this day. In fact, the Spanish city of Cuzco is built upon the old Inca foundations. It is amazing that such a small body of men as that commanded by Pizarro could work such havoc with a large population. But the Incas were peaceful and unused to war, to intercourse with men from the outside world, to the strange and fearsome arms used by the Spanish, and above all, to Spanish treachery.

Whilst Pizarro was subduing and enslaving the Incas, Almagro had reached, but was not successful in conquering, Chile. Pizarro's brother crossed the Andes, and in 1541 found the headstreams of the Amazon, which was followed to its mouth by one of his companions named Francisco de Orellana. The river received its name from the reports which the latter made of tribes of female warriors. It was Orellana who circulated the stories of an El Dorado up the Orinoco and this led to the unhappy expedition of Sir Walter Raleigh.

It will thus be seen that fifty years after the first voyage of Columbus, the coast-line of South America was fairly well known. The whole continent was given by the Papal Bull to Spain and Portugal, the latter having Brazil. The Spaniards

also held Central America, Mexico, large parts of what is now the United States, and all the West Indies. To-day, not one square mile is Spanish! This seems very remarkable, yet it is easily understood when we consider the use to which the Spaniards put these colonies. Little attempt was made to cultivate the land, or to provide homes for emigrants from the homeland. No attempt was made to deal sympathetically with either the natives or their institutions. The American possessions of Spain were badly ruled, and used mainly for the purpose of supplying the mother country with vast quantities of gold, silver, copper, quicksilver, etc. The rising countries of Europe, such as England and the Netherlands, were not allowed to trade with the Spanish Colonies, whose products had to be bought through Spaniards. Thus Spain raised the price of gold and silver in Europe, and of European commodities in the Spain beyond the seas, and the natural result was smuggling, for the other countries were determined to have some share.

Most of the republics of South America became independent during the early part of the nineteenth century, Callao, the last Spanish station on the mainland, falling in 1826. Brazil is no longer Portuguese, although it should be noted that the Portuguese conquest of Brazil was not as cruel as the Spanish conquests. Portugal treated the country as a home for its surplus population, and encouraged settlement and agricultural development. As the natives were not suitable for work on the plantations, the Portuguese introduced large numbers of negro slaves to do the manual work. The final separation from Portugal took place in 1822 and was peacefully accomplished.

These conquests have, of course, influenced the languages spoken in America south of the United States. Spanish is the language everywhere, except in Brazil, where Portuguese is spoken, and the three Guianas.

CHAPTER XXVI

THE PHYSICAL FEATURES OF SOUTH AMERICA

SOUTH AMERICA stretches from 12° N. to 55° S. Compare this with Africa and you will see that Africa does not reach as far south, but extends farther northwards. Examine the positions of the two continents with regard to the equator. About four-fifths of South America is within the tropics. Name the oceans which wash its shores. The area of the continent is about 7,000,000 square miles, whilst the area of Africa is 11,500,000 square miles, and that of Australia, the third southern continent, nearly 3,000,000 square miles.

Compared with its great size, South America has a short coast-line, and this, of course, is due to the absence of peninsulas. It is nearly twice as large as Europe, but its coast-line is only three-quarters the length of the European coast-line.

COMPARISONS WITH NORTH AMERICA

If you compare the physical maps of North and South America in your atlas, you will at once notice—

1. Both continents are broadest in the north and taper towards the south, being roughly triangular in shape. Is this true of the other continents? Think of Europe and Asia as one continental mass.
2. (a) The highest mountain masses are in the west of each continent. In both continents these consist mainly of younger folded ranges, plateaus, etc. Compare Figs. 7 and 64.
- (b) In the east of each continent there are also highlands, and in each case these are lower and older than the western highlands.
- (c) The centre of each is largely occupied by plains.

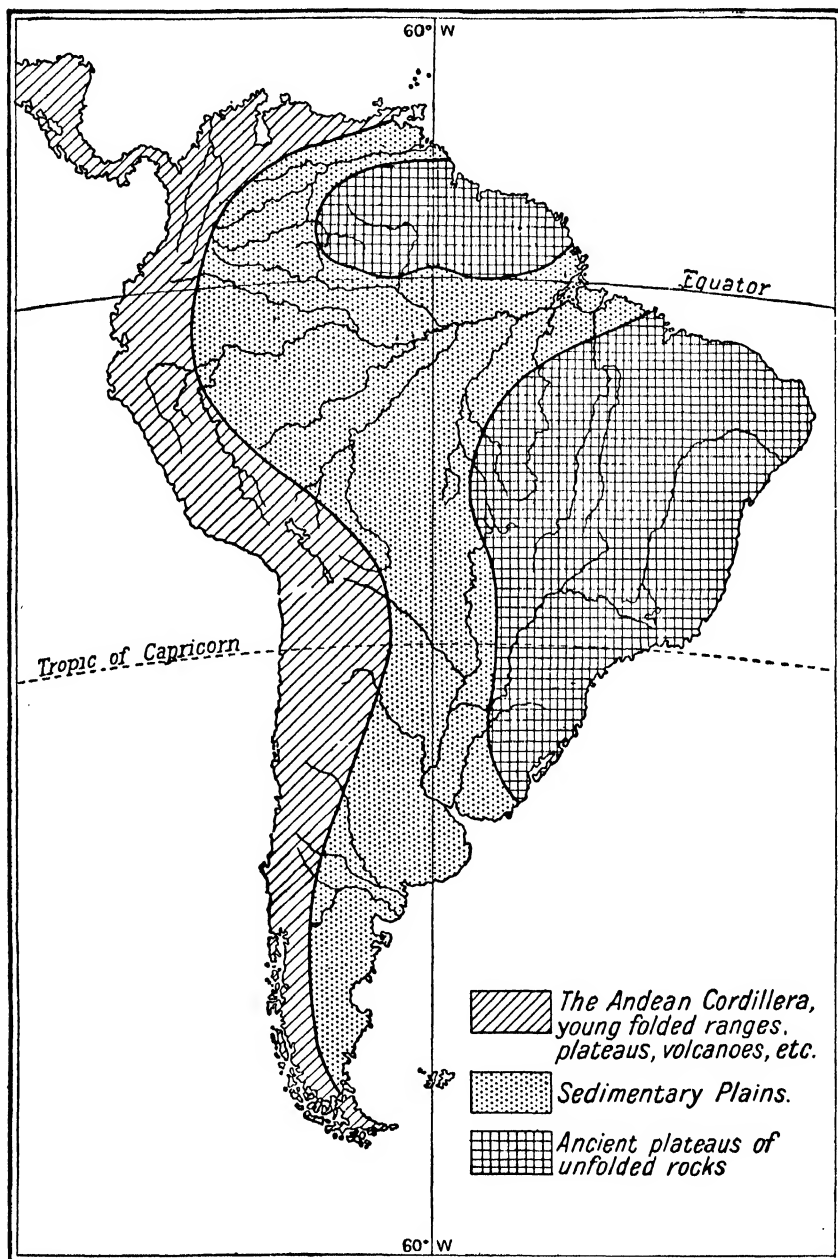


FIG. 64.—The chief structural divisions of South America.

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3. The direction of the river drainage may be compared.

Name—

(a) The rivers in each continent which drain northwards.

(b) The great rivers which drain eastwards.

(c) Those which drain southwards.

CONTRASTS BETWEEN NORTH AND SOUTH AMERICA

1. South America has no river of any importance draining into the Pacific. North America has such large rivers as the Fraser, Columbia, Sacramento and Colorado all flowing westwards.

2. South America is broadest where it is hottest, whilst the opposite is true of the northern continent.

3. South America has no large islands off its southern shores to compare with the frozen archipelago of North America.

4. In South America there are no large openings like Hudson Bay, or long gulfs or peninsulas like those of Lower California.

5. Although the mean elevation of each continent is about 2,000 feet, there is not such a large percentage of North America with an elevation of less than 600 feet above sea-level as there is in South America.

6. South America has no area comparable with the old worn-down highland region around Hudson Bay. (Compare Figs. 7 and 64.)

7. The eastern highlands of South America consist of plateaus of unfolded rocks, whilst those of North America consist of folded mountains which have been denuded to a plateau, the subsequent uplift of which has produced the present appearance of the Appalachians.

HIGHLANDS AND LOWLANDS

The most prominent feature on the map is the great *Andean Cordillera*. The remaining highlands will fall under the two headings: the *Brazilian Highlands* and the *Guiana Highlands*. Now notice the plains and you will see that there is a great area under 600 feet in height. Only in Europe, in proportion to its size, is there more land under 600 feet. It will

be seen that the plains are between the three highland regions named and are drained by great rivers. The plains in the valley of the Parana-Paraguay are called the *Pampas Lands*, those in the valley of the Amazon the *Selvas*, and those in the valley of the Orinoco the *Llanos*. These vast plains were formerly the beds of seas which have been filled by the deposits washed from the surrounding mountains and brought down by rivers. Now let us examine these highlands and lowlands in more detail.

THE ANDES

Using the scale given on your atlas map, find out how long the Andes are from north to south and how broad they are at their widest part. They are so high that the highest parts are snow-capped all the year throughout the entire length. Compared with their length, they are remarkably straight, and the change in direction is where they are broadest. Now let us trace the system from north to south. Three ranges from the Caribbean Sea meet at the knot of Pasto and continue as two main chains, enclosing the very high narrow plateau of Ecuador, which is about 8,000 feet high, although the peaks of the two main chains flanking the plateau are very much higher. (See Fig. 74.) There are many volcanoes here, perhaps the best known being Cotopaxi which is over 19,000 feet in height, that is, nearly three and three-quarter miles, although Chimborazo reaches almost four miles in height. This volcano overlooks the city of Quito which is very near to the equator.

Southwards, in Peru, the Andes have three well-marked ranges, whilst the enclosed plateaus are broader. (Fig. 75.) It is here that the Amazon and many of its tributaries rise. Farther south, in the broad plateau of Bolivia, buttressed on the east and west by high mountains, the system is at its widest. This plateau is about 12,000 feet above sea level, and some of the high peaks are considerably over 20,000 feet. Sorata is one of the highest peaks in the continent and reaches almost 22,000 feet. On this plateau is Lake Titicaca overlooked by Sorata. It has no outlet to the sea, and is, therefore, a centre of inland drainage like the Great Salt Lake of North America, and, like that lake, was at one time very

much larger. South of this plateau the Andes is one giant range, and it is here that we have the highest peak in the Americas, Mount Aconcagua, a great volcano about 23,000 feet in height. Just south of it you will find marked the Uspallata or Cumbre Pass, below which tunnels the principal

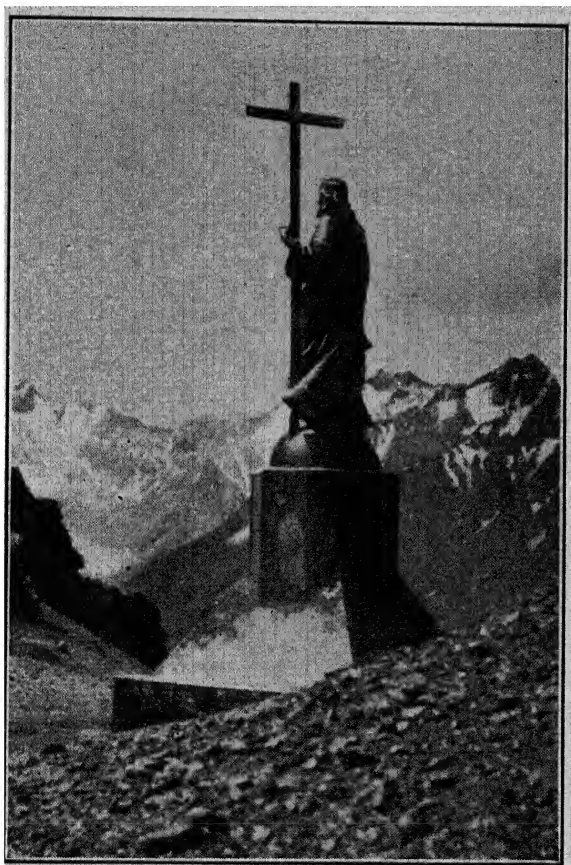


Photo by E.N.A.

FIG. 65.—Argentine Republic. The famous statue of Christ which stands in the very heart of the Andes at Puente Del Inca, Mendoza, on the dividing line between Argentina and Chile.

trans-Andean railway. The line connects Buenos Aires with Valparaiso, and the difficulty experienced in constructing it may be imagined by the fact that the tunnel is only

a little short of two miles above sea level. At the summit

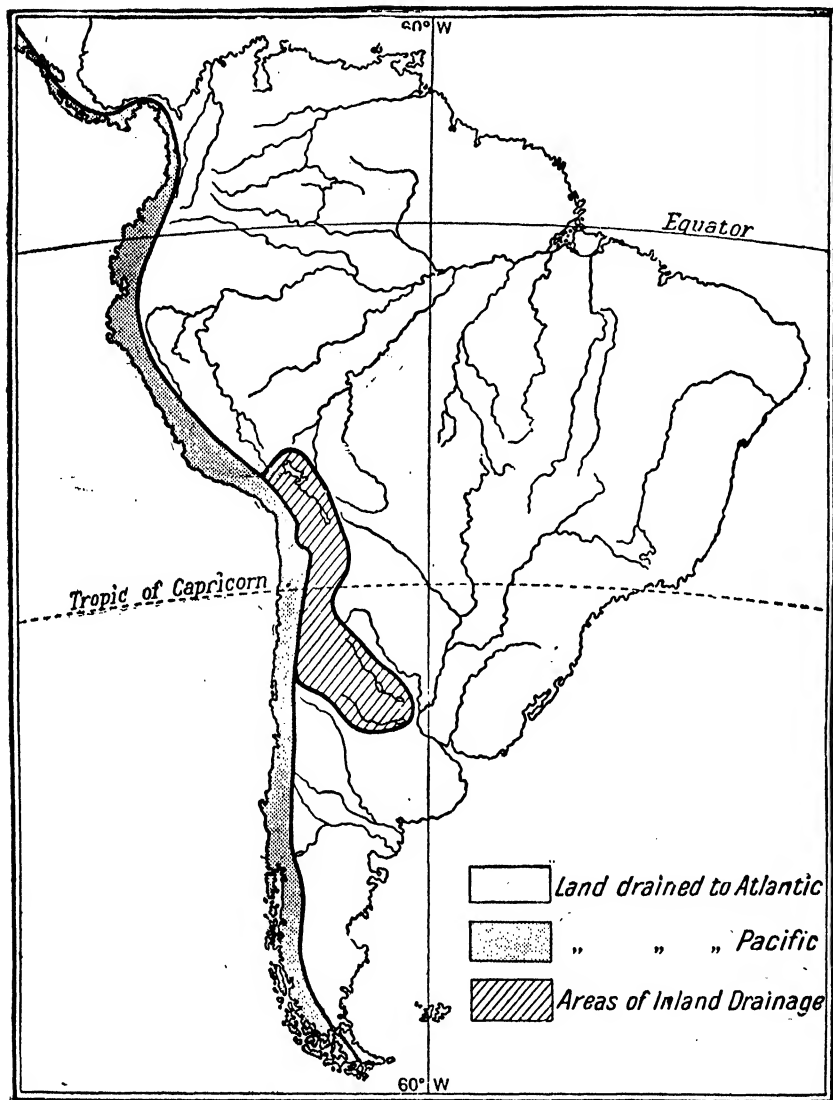


FIG. 66.—The drainage of South America.

of the pass, on the boundary between Chile and Argentina, is an enormous bronze statue of Christ, erected to celebrate

the peace made in 1902. The two countries have sculptured on the base of the statue these words—

“SOONER SHALL THESE MOUNTAINS CRUMBLE
INTO DUST THAN THE PEOPLE OF
ARGENTINA AND CHILE BREAK THE PEACE
WHICH THEY HAVE SWORN TO MAINTAIN AT
THE FEET OF CHRIST THE REDEEMER.”

Southwards, the Andes still contain snow-capped peaks and volcanoes, but are diminished in height. Your map will show many lakes skirting the eastern edges, whilst the western edges are fringed by countless islands and are pierced by long, narrow fiords. Which coast-line in North America resembles that of southern Chile? (See Fig. 36.)

It is interesting to notice the influence of the position of the Andes upon the drainage of the continent. Fig. 66 shows the land drained into (*a*) the Pacific, (*b*) the Atlantic, (*c*) inland drainage systems. You will at once observe the comparatively small area drained into the Pacific and the large area drained eastwards. Is this also true of North America? From which ocean are the interior lands of these continents easier to approach? Like the western highlands of North America, the Andes are close to the Pacific Coast.

THE LOWLANDS

We have already stated that the vast lowlands of the Orinoco, the Amazon and the Plate were once great inland seas. We have learned that rivers bring down sediment, and that this ceases to be carried along in suspension and falls to the bottom when the current receives a check. The rivers rising in the three great highland areas of South America and running to these former seas would all be bringing down sediment, and in time—and of course it would be an extremely long time—the sea would be filled with sediment, and the great river systems formed. This was probably hastened by some uplift of the bed itself.

As may be expected, these great rivers are not confined to their banks in flood times, each in its flood season resembling, in parts, a long, narrow lake rather than a river.

Find the town of Iquitos. It is on the Amazon, near the

eastern base of the Andes, 1,700 miles from the sea, and can be reached by ocean vessels. It is built about 300 feet above sea level. That means that the average fall from Iquitos to the sea is only about two inches per mile. This gives you an idea of the flatness of these filled-up seas.

THE BRAZILIAN AND GUIANA HIGHLANDS

These highlands are separated from each other by the broad lowlands of the Amazon. Just as the Andes may be compared with the Rockies, so these may be compared with the eastern highlands of North America. The Brazilian and Guiana highlands are plateaus, which have been worn down very much indeed, and are intersected by deep gorges, through which flow the rivers. They have also been faulted into masses of table-shaped block mountains. (See Fig. 12.)

These plateaus are fragments of an old continent which stretched right across the South Atlantic, and joined them to each other, and to the similar plateaus of Africa, Arabia, India and Western Australia. Great faultings and subsidences have formed the oceans which now separate them. Look carefully at the physical map. You will see that the Brazilian highlands are highest along the coast and that the plateau is tilted with a gradual slope to the Amazon. To the ocean, a steep face or escarpment is presented. The many rivers which drain the plateau are broken by waterfalls, and the limit of navigation is generally situated where the rivers leave the plateau for the plains. (See Fig. 77.)

EXERCISES

1. Turn to Fig. 4. Make a similar diagram showing the area of South America more than 500 miles from the sea. Draw two circles to scale, so that each has a diameter of 2,000 miles, and encloses as small an area of sea as possible.

2. Using the physical map of South America in your atlas, construct a section across the continent along the line of the equator. Compare it with another section along the parallel of latitude 20° S. Be careful not to exaggerate the vertical scale too much.

3. Compare the general build of the two Americas.

4. Make a sketch map showing the physical features of South America.

5. Examine Fig. 5, which is a key to the structure of the western Cordillera of North America. Using your atlas and Figs. 74 and 75 make a similar diagram for the Andean Cordillera.

6. Draw a sketch map of South America showing boldly (a) the three principal highlands, (b) the three great lowlands, (c) the three great rivers. You ought to be able to do this in two or three minutes.

CHAPTER XXVII

THE CLIMATE OF SOUTH AMERICA

1. *Temperature*.—Examine Fig. 67. This gives sea-level isotherms for the coldest and warmest months. You must notice that south of the equator, January is the warmest, and July the coldest, month. In January the sun is overhead south of the equator, and in July, north of the equator. The sun reaches the Tropic of Capricorn, the farthest limit at which it is seen overhead south of the equator, on December 21st, whilst on the 21st of June it is overhead at the Northern Tropic. This explains why the region of greatest heat is farther south in January than in July. Notice, too, that South America is broadest where the temperature is greatest, *i.e.* in the north, so that the greater part of the continent is always hot. It must also be kept in mind that these maps are made from statistics that have been corrected to sea-level readings. This means that 1° F. has been added for about every 300 feet of elevation, so that the map does not give the actual temperatures experienced on the highland regions, which vary in temperature according to height and position.

2. *Rainfall*.—Examine Fig. 68, which shows the annual rainfall and the seasonal distribution of rain. It will also be seen that the prevailing winds over all the continent north of 30° S. are the north-east and south-east trade winds. But south of 30° S. the prevailing winds are the westerlies.

In studying Fig. 68 it is important to notice that—

- (1) The north of South America, Central America and the West Indies get most rain in summer.
- (2) The equatorial regions get rain all the year round. The mean annual rainfall is here over 80° .
- (3) The Brazilian highlands and the Pampas lands get most rain in summer (which is the northern winter).

- (4) Southern Chile, like all the highlands exposed to wet winds throughout the year, gets rain at all seasons.
- (5) Central Chile (the district containing Valparaíso and Santiago) gets most rain in winter.
- (6) There is (a) an almost rainless area north of the last area and extending as far northwards as the Gulf of Guayaquil; (b) another area of deficient rainfall stretching from the Bolivian plateau to the eastern slopes of the southern Andes.

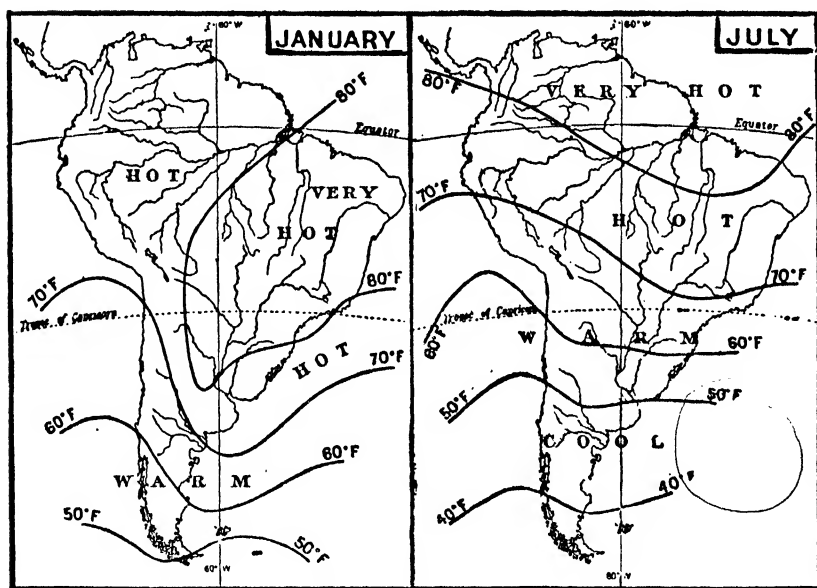


FIG. 67.—Temperature maps for January and July.

As there is no region in North America like the Amazon basin, we shall first account for the heavy rainfall in that region. If you look at the rainfall map, you will see that the winds which bring this heavy rainfall are the north-east and south-east Trades, and that they have come over great expanses of water, and must, therefore, contain water vapour, which will be precipitated if the air currents are forced to rise. This they are compelled to do when—

- (1) the trade winds reach the equatorial area of great heat and therefore of low pressure.

- (2) the winds meet the great barrier of the Andes, which are so high that there is a heavy fall of rain on their eastern or windward slopes.

The summer rains of the regions to the north and south of this Amazonian region of rain all the year round are due to the migration of the sun between the tropics, for the temperature, wind and rain belts are affected by these migrations. The almost rainless region on the west coast is to the lee

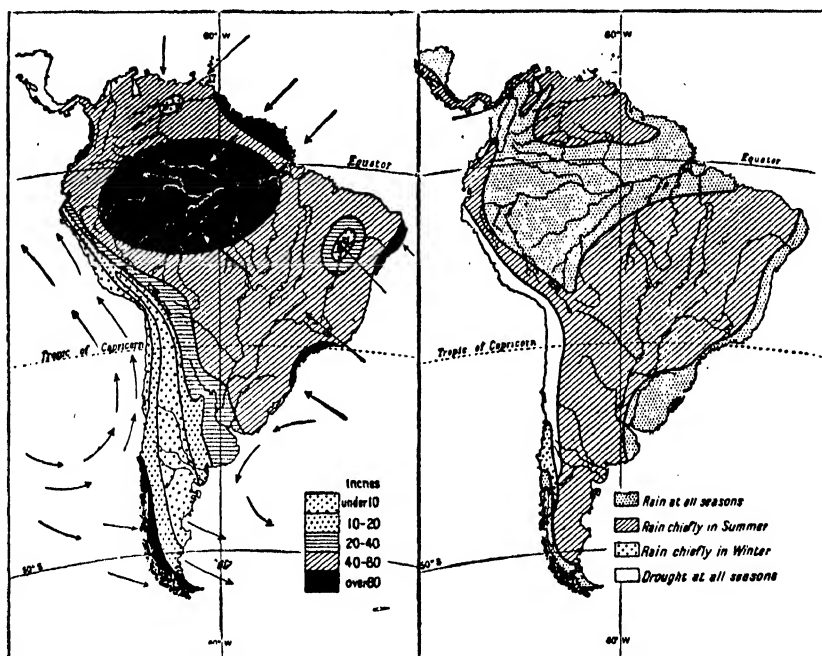


FIG. 68.—Mean annual and seasonal distribution rainfall maps of South America.

of the Andes. In Chile it is the Atacama desert, and further north the coastal strip of Peru. These regions may be compared with the Colorado desert of North America. In the southern Andes the desert conditions are found to the east of the mountains, but it must be noticed that this is the lee side, for in these latitudes the prevailing winds are the westerlies. You will notice that the Atacama desert extends into temperate latitudes. The rainlessness here is largely

due to the fact that the winds blow parallel to the coast. (See Fig. 68.) South of the Atacama desert there is a region of winter rainfall, which you should compare in latitude and seasonal distribution of rain with California. Both are transition areas of summer drought and winter rainfall. Southern Chile receives westerlies all the year round, and therefore rain falls at all seasons. It may be compared with the coastlands of British Columbia in this respect. Finally, there are the pampas lands and the drier lands towards the foot of the eastern Andes. Like the prairies of North America, the pampas lands are lands of summer rainfall, for at that season the moist winds from the Atlantic Ocean penetrate far into the interior of these great plains, but, as in North America, do not bring much rain on the belt of country at the foot of the Western Cordillera.

EXERCISES

1. MEAN MONTHLY TEMPERATURE, IN DEGREES FAHR.

	Height above sea-level.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Average for Year.
	Feet.													
{ Manaos	121	78	78	78	78	78	79	79	79	80	80	81	80	79
{ Quito	9,350	54	54	54	54	55	55	55	55	55	55	54	54	54.5
{ Antofagasta	13	71	70	69	66	64	63	62	62	62	63	65	68	65
{ Salta	3,965	71	70	68	67	57	51	52	56	62	67	71	72	64
{ Asuncion	344	80	80	78	73	66	61	65	67	68	73	77	81	72
{ Rio de Janeiro	197	77	78	77	74	71	68	67	69	70	71	73	75	72.5

MEAN MONTHLY RAINFALL, IN INCHES

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Total for Year.
{ Manaos	9.8	9.6	11.9	13.0	7.5	5.1	3.0	1.8	1.5	3.9	6.4	10.3	83.8
{ Quito	4.2	4.0	5.3	7.3	5.1	1.5	0.9	1.5	2.9	3.7	3.8	3.9	44.1
{ Antofagasta . . . . .	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
{ Salta	5.4	4.8	4.0	1.1	0.4	.0	.0	0.1	0.2	0.5	2.2	3.4	22.1
{ Asuncion	6.8	5.3	6.1	5.8	4.4	2.9	2.4	1.8	3.5	5.5	5.9	5.2	55.6
{ Rio de Janeiro	4.8	4.4	5.1	4.6	3.7	1.9	1.7	1.9	2.3	3.1	4.3	5.6	43.4

Find the position of each of these places. Notice that the last four towns are almost in the same latitude. Draw the curves for the temperature figures and columns for the rainfall figures, keeping the towns bracketed on separate diagrams. When you have drawn the diagrams, write a full description accounting for all contrasts or similarities which you notice.

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2. Compare the distribution of rain on the west coast of South America with that on the west coast of North America.
3. Examine Fig. 68 and account for the fact that some areas receive rain at all seasons, whilst others lack rain at all seasons.
4. The Atacama desert is west and the Patagonia desert is east of the Andes. How do you account for this ?

CHAPTER XXVIII

THE DISTRIBUTION OF NATURAL VEGETATION

THE FORESTS

The Hot Wet Forests.—We have seen that the Amazon lowlands and the equatorial coastlands have heat and con-



Photo by E.N.A.

FIG. 69.—Brazil—State of Amazonas. A virgin forest, showing a party of orchid hunters on horseback. Compare the size of the horses and men with the gigantic trees behind them.

siderable rain at all times of the year. These conditions give equatorial forests known as *Selvas*. In these forests the vegetation grows with the utmost profusion. There is a constant fight to seek the light, and at first the great giant trees appear to succeed; but in time the creepers, which form festoons linking tree to tree, gradually strangle the

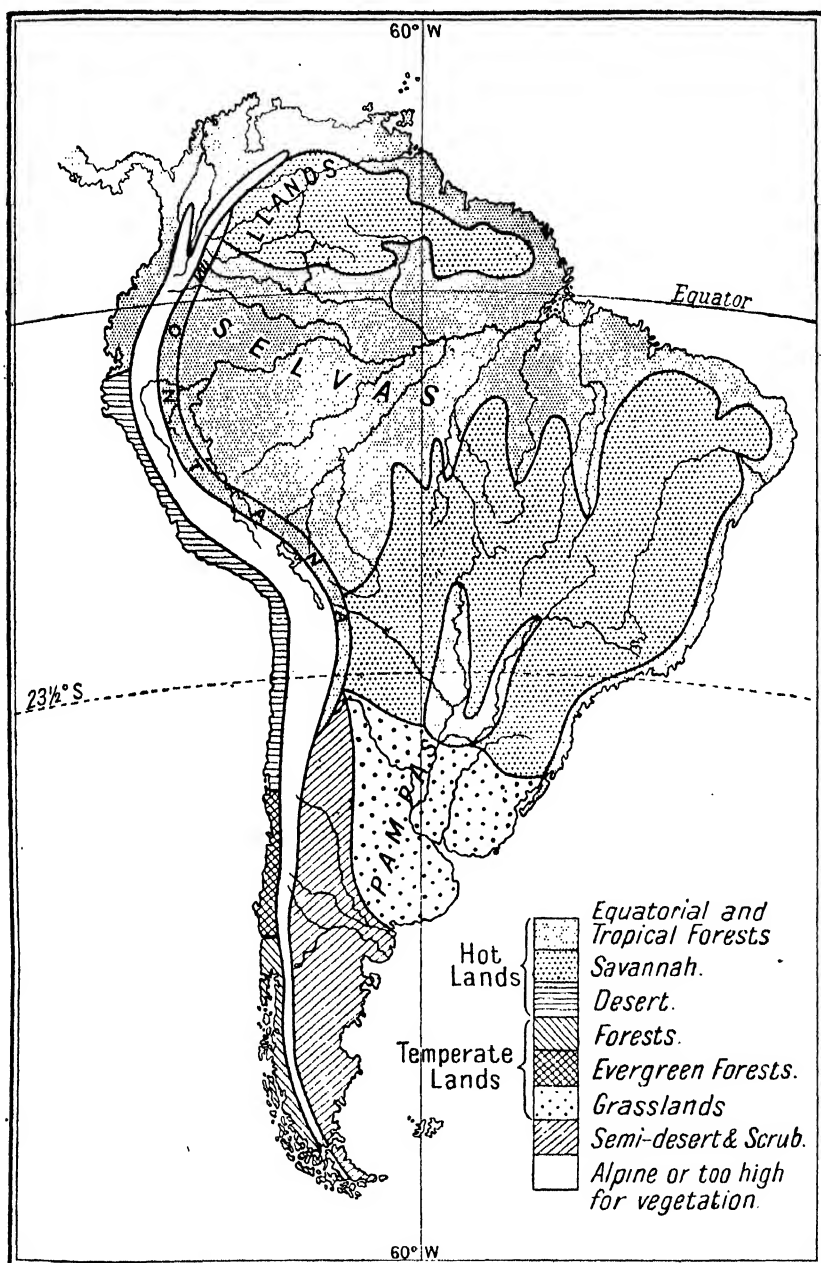


FIG. 70.—The distribution of natural vegetation in South America.

giants and down they come. Most of the growing part of the vegetation is high above the ground from which it often looks like a kind of panoply supported by a multitude of scaffolding poles. Thus the Selvas are very gloomy and dark, and it is with a sigh of relief that a traveller comes out again into the scorching heat of the sun.

The grandeur of the Amazon forest lies in its solemnity, its vastness, and the apparently hopeless tangle of dense masses of trees of all sizes. The great waterways are the chief means of travel, for the vegetation grows at such a rate, that paths and roadways cut through the forest would soon get overgrown. The telegraph cable to the river ports has been laid at the bottom of the Amazon, just as though it were an ocean cable.

It should be noted that the eastern slopes of the Andes, in the area of the Trades, receive very great rainfall, and although high, are forested, but not in such great profusion as on the lowlands. These forests are known as the *Montana* (see Fig. 70), and here, in the forest clearings, it is suitable for the cultivation of such tropical products as cacao, sarsaparilla and cinchona.

In the middle courses of the Paraguay and Parana rivers there is a sub-tropical forest. (See Fig. 70.) This region is neither so hot nor so wet as the Selvas. The most important tree is the yerba maté, or Paraguay tea. The leaves and twigs are dried and afterwards ground into a coarse powder. When infused, it gives a drink that is in great demand in all the countries of South America.

The Temperate Forests.—In South America, these are found in central and southern Chile. The latter may be compared with British Columbia in North America and with Norway in Europe. The southern Andes are not very high, and their wet exposed windward slopes are densely forested with mixed deciduous and coniferous trees. Lumbering is one of the occupations, although the forests, as yet, have been scarcely touched by man. Where the trees have been cleared, cattle-rearing is carried on.

Central Chile has evergreen forests similar to those of California. The rain falls mainly in winter, so that the trees have to adapt themselves to withstand summer drought. The leaves are thick and shiny, and the roots strike deep down

into the earth. Evergreen oaks, walnuts and chestnuts are characteristic trees. Most of the fruits of the Mediterranean lands have been introduced, the vine being the most important.

THE GRASS-LANDS

1. *The Tropical Grass-lands or Savannahs.*—These are found to the north and south of the equatorial forests. The northern areas are the *Llanos* of the Orinoco and the Guiana highlands; and the southern savannahs, or campos, are found

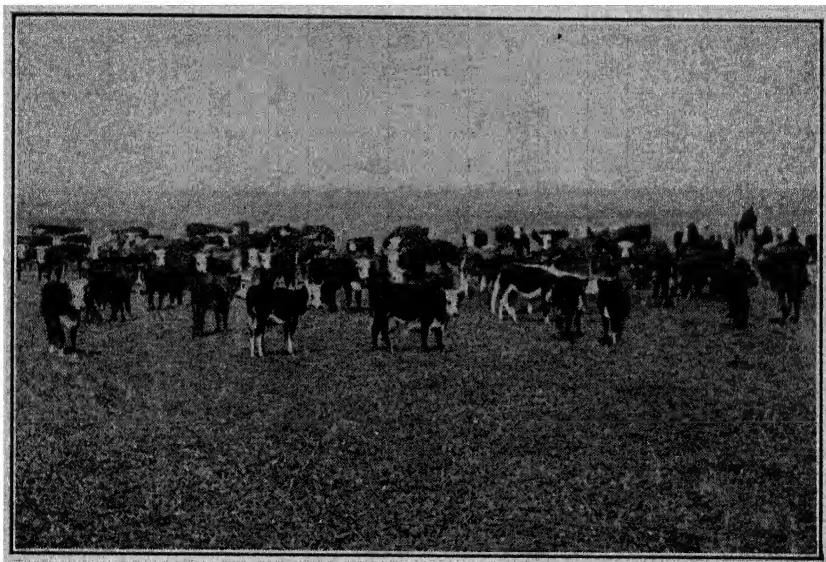


Photo by E.N.A.

FIG. 71.—Argentine Republic. Cattle on the Pampas.

on the Brazilian highlands. Examine the temperature and rainfall maps, and find out at what time of the year these savannah regions (*a*) get most heat, (*b*) receive most rain. You will find that both are received at the same season, *i.e.* in summer. The natural vegetation best adapted to this type of climate, given of course that the soil is suitable, is grass. The typical landscape in a savannah region is a gently undulating grass-land, with woodlands in patches, thus giving a natural park-like appearance. The natural occupations are agriculture and stock-rearing, but these are not carried on

to the same extent as in the African savannahs north and south of the Congo forests.

2. *The Temperate Grass-lands.*—Notice the position of these. (See Fig. 70.) When do these grass-lands receive most rain and heat? Compare them in this respect with the savannahs. Unlike the latter they are generally treeless, except near the water-courses. The South American temperate grass-lands may be compared with the prairies of North America, although it must be pointed out that the prairies are much farther from the equator and from the ocean, and therefore have a more extreme climate.

As with the Indians of the prairies, modern development has forced the Gauchos—tribes of mixed Indian and Spanish descent—either to follow a more settled mode of life or to retreat farther inland. The Gauchos, whose numbers are small, live nomadic lives, and tend horses, sheep and cattle. They are exceptionally fine horsemen. See Fig. 76, and observe that both cattle and sheep are reared on the temperate grass-lands, but sheep are not found in the tropical grass-lands. West of the Parana the grass-lands are known as the *Pampas*.

THE DESERTS AND SEMI-DESERTS

1. *The Coast Desert of Northern Chile and Peru.*—Notice the position of this desert, and compare it with that of the Colorado Desert of North America. Try to remember that in the Americas we have found hot deserts in the trade-wind areas, on the west sides of those continents. Perhaps you will be sufficiently keen to look up a vegetation map of the world, and see if this holds good in other continents? The only parts where vegetation is found are in the narrow valleys of the rivers which cross it.

2. *The Dry Plains between the Pampas Lands and the Andes.*—These may be compared with the high plains extending from Alberta to Texas. They have a rather more extreme climate than the grass-lands of the Pampas regions, and the rainfall is very small, so that agriculture is dependent upon irrigation, apart from which settled life is not possible.

3. *The Patagonian Desert.*—This cool temperate desert occupies the low plateau of southern Argentina. Patagonia is a shingle and sand desert, although the western belt near to the

water-shed is capable of considerable development. Numbers of guanaco, rhea, and sheep find means of support in the scattered patches of bush and grass. The guanaco, like the llama, resembles a camel. The rhea is the South American ostrich. It has three toes, and its head and neck are feathered; but its feathers are not so valuable as those of the South African ostrich, which has been introduced into Argentina.

There is only one more vegetation unit to mention, and that is the Mountain or Alpine flora type. Fig. 70 shows a long belt of mountain flora following the Andes. Much of the area so marked is too high for any vegetation, whilst there are many grass-covered areas on the high plateaus, where large numbers of cattle, sheep, llamas, alpacas and vicunas are reared.

EXERCISES

1. Give examples from South America of the connections between relief, temperature and rainfall, and natural vegetation.
2. Describe the vegetation conditions of the basin of the Amazon, and compare the region with similar areas. Find accounts of a typical area in the forest and note carefully the difference between conditions (a) on the floor, (b) in the roof or canopy of the forest.
3. Compare the vegetation units on the west coasts of North and South America.
4. Explain each of the following terms : selvas, llanos, pampas, campos.

CHAPTER XXIX

THE NATURAL REGIONS OF SOUTH AMERICA

We have now considered the physical features, the climate and the vegetation of South America. We have also learned something of the natural occupations of its inhabitants, so that we are in a position to divide the continent into units or natural regions, throughout each of which the same set of physical, climatic and vegetation conditions predominate. We shall consider the lowland regions first, the older highland regions next, and lastly the regions of the Western Highlands.

Whilst reading this chapter, constant reference should be made to the atlas, to the temperature, rainfall and vegetation maps (Figs. 67-8), and to Fig. 72.

THE AMAZON BASIN

The basin of the Amazon is the largest river basin in the world. The main stream is about 3,500 miles long, which is longer than the journey from Liverpool to New York. Its magnificent waterways form the chief means of communication, the forests being so dense. Two hundred and fifty miles from its mouth the river is 50 miles wide, in depth it often reaches 20 fathoms, whilst it is navigable from its mouth right to the base of the Andes. Such an enormous quantity of water is carried oceanwards that the river water can be traced for a very considerable distance out to sea. Notice the head-streams of the Amazon. Can you account for the direction of their courses before they reach the plains? You will also observe that the main stream runs eastwards, roughly parallel to the equator, which it reaches at its estuary. The chief tributary on the left bank is the Negro, and on the right bank the Madeira. Fig. 73 shows that the Negro is joined to the Orinoco by the Cassiquiare River. This is an example of what is known as "river-capture" in an incom-

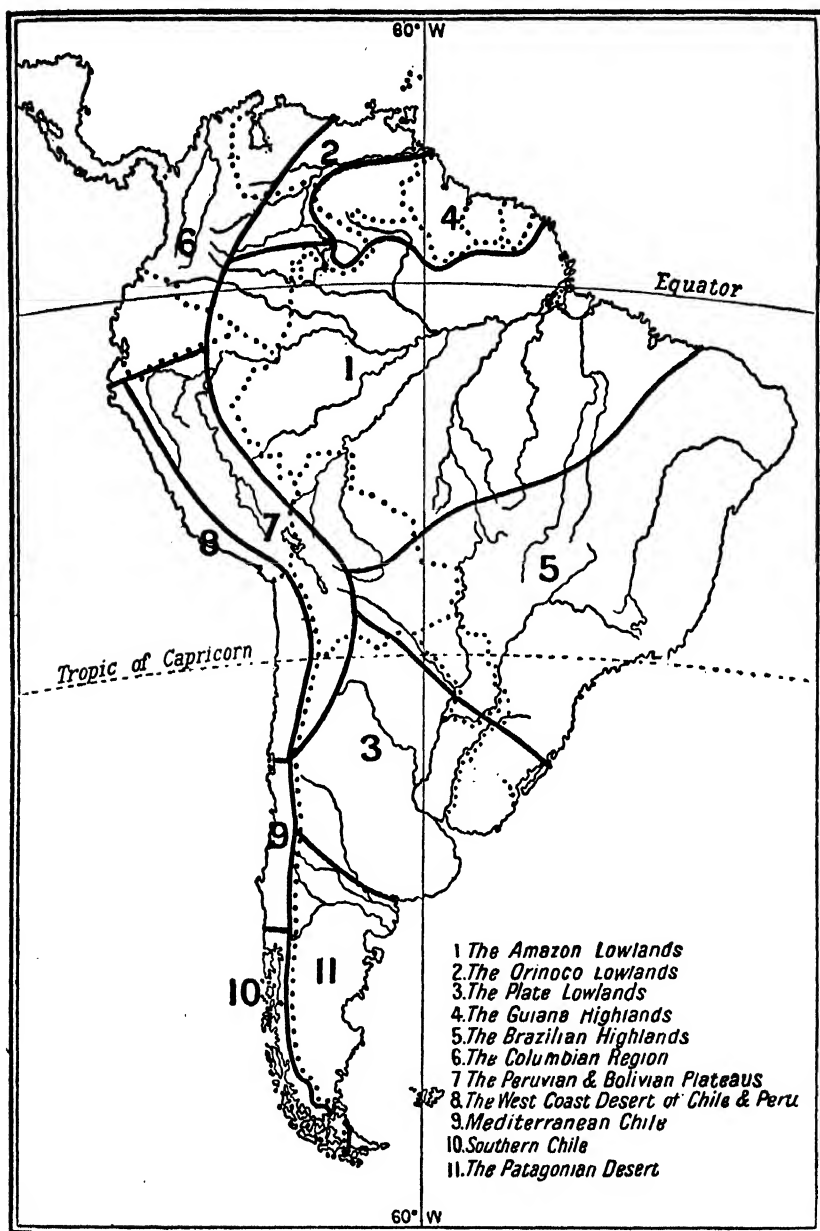


FIG. 72.—The natural regions of South America. The dotted lines show the political boundaries.

plete state. Vigorous rivers are constantly eating back their sources into the watersheds separating them from other rivers, and in time cut back into the valleys of neighbouring rivers. This has been done in this case. The stronger river will eventually take to itself the Cassiquiare and some of the waters of the weaker river. The watershed is not yet defined. There is another case of river-capture not so far advanced. Notice how close are the head-streams of the

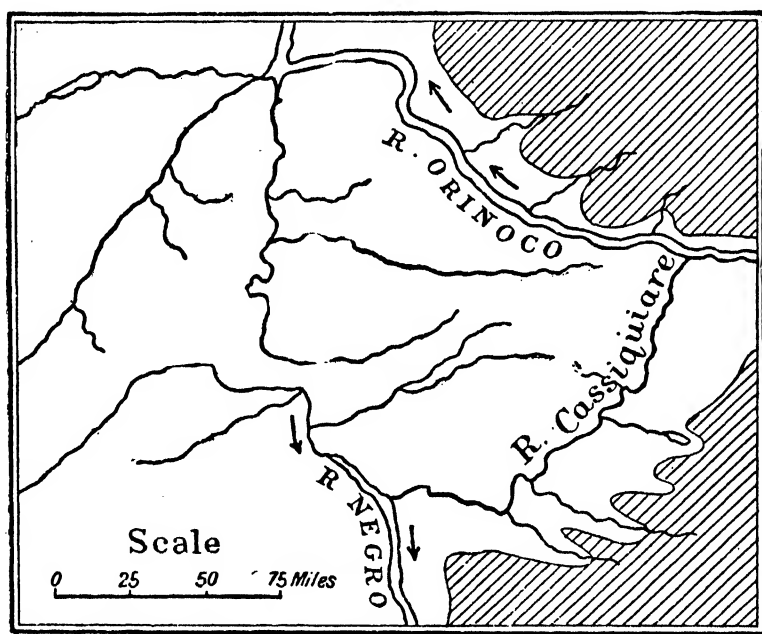


FIG. 73.—The River Cassiquiare. This map, on which the higher ground is shaded, shows that the Cassiquiare connects the Orinoco and the Negro.

Tapajos and the Paraguay. In the wet season these rivers are actually united, the divide between them being very low.

The physical and vegetation conditions in the Amazon basin have been described. It is a hot tropical forest, which, as you would expect, finds homes for very few people. Large areas are not developed, indeed considerable tracts have not even been explored. The inhabitants are very backward, and exist mainly by fishing and turtle-catching; they live in wretched hovels made of twigs and mud, obtaining little

vegetable food beyond bananas and wild fruits. Their boats are the hollowed-out trunks of trees. Many of them are now employed in collecting rubber, which is by far the chief product of this area, although it is not by any means the only important vegetable product. As the region becomes better known, and means of transport become cheaper, there are vast numbers of valuable timber trees which will find their way to the ports for exportation. When clearings have been made, almost every kind of tropical product will be cultivated.

Some mention should be made of the animals of these hot, wet forests. Naturally, they will be mainly tree-dwellers. Reptiles, including great tree-snakes and alligators, abound. Monkeys are very numerous, and the forests often resound with their cries. Birds of many varieties are found, including brilliantly coloured parrots, humming birds and birds of paradise. The larger animals, such as the elephant and hippopotamus, are entirely absent, except for the timid and inoffensive tapir, which may be said to represent the elephant.

Chief Trading Centres.—The chief port for rubber is *Para*. Observe the position of this port on the Para Channel, which is south of the large island of Marajo, at the mouth of the Amazon. The Para Channel gives the best approach to the river.

Manaos, at the junction of the Negro with the main stream, is a river port and an important rubber collecting centre. It can be reached by large steamers.

THE LOWLANDS OF THE ORINOCO

The lowlands of the Orinoco, known as the llanos, are between the Guiana highlands and the eastern extension of the Andes. Describe the vegetation of these lowlands. Notice that the Orinoco, which is 1,550 miles in length, rises in a range in the south of the Guiana highlands, and that it then runs in a great bend skirting the highlands, its longer tributaries coming from the Andes. These lowlands receive considerable rain in summer. Notice, however, their nearness to the equator, and remember that their "winter" months are hot and very dry. If you look at your atlas again, you will notice that there are no large towns marked on the lower courses of the river or on the delta. This is owing to the great summer floods. The chief town is the river-port of

Bolivar, the centre of a growing cattle-rearing industry.

These grass-lands, and this is true of other South American grass-lands, produced neither cattle nor horses, nor any of the large domestic animals of similar regions in the old world. This partly accounts for the smaller native population compared with similar regions in Africa and Asia. Another reason has just been mentioned. It is the fact that the dry seasons are often so droughty that, in this season, great tracts of the llanos are little better than deserts.

THE PLATE LOWLANDS

An examination of the map will show that the Paraguay, Parana and Uruguay Rivers form the estuary known as the Plate River (Rio de la Plata). Observe the great width of this estuary. Where does each of these rivers rise? The upper courses of the Parana and Paraguay are little known. They traverse an almost uninhabited forested country. In descending from the Brazilian highlands, the Parana forms many waterfalls.

Look again at the Vegetation Map (Fig. 70), and you will see that in their lower courses these rivers cross the grassy plains known as the Pampas Lands. To the west are the drier areas, where the grass-lands merge into semi-desert and scrub lands. In the north in northern Argentina, western Paraguay and south-eastern Bolivia, there is the extensive area of forest and savannah land known as the Gran Chaco ("great hunting-ground"). It is a little known region.

A great change has come over these lowlands in recent years, for a development has taken place which may be compared with that of the prairies of North America. The Pampas Lands now support millions of cattle and sheep, whilst in the better watered lands of the Plate in the south, maize and wheat are grown in great quantities. Alfalfa is also very largely grown for fodder. Being deep-rooted, like most plants which thrive best in dry climates, it is suited to the climate of the pampas. Three or four crops yearly can be obtained.

All the drier areas of the southern continents suffer from locusts, and the Plate lowlands are no exception. They do very great damage, especially to maize, for the usual time at which they appear is before the maize harvest, at a time when

the corn is soft and juicy. Efforts are made to destroy the locusts before their wings appear, for after that stage has been passed, the planter can do little to prevent their destructive work. Poultry and ostriches eat them; but the eggs of the former are quite unsuitable for human food for some time after such a repast. It is believed that they breed in the Gran Chaco, and will probably decrease in numbers when that region is better known and extensive areas have been cleared. Try to get a good account of a flight of locusts. You will be astounded at their number, and at the tremendous damage they do in a very short time.

The Plate lowlands have very little coal, and, except where the Parana and the rivers from the east leave the plateau, there are no falls, so that water power cannot be used. Therefore it is very likely that agriculture will always be the chief industry. Petroleum is obtained in the Comodoro Rivadavia district of Argentina, but the amount obtained is insufficient for the requirements of the country. Less coal, however, has been imported during recent years.

The ports through which most of the trade is done are *Buenos Aires*, *Montevideo*, and the river port of *Rosario*. Fig. 77 shows the chief railways of this region. (See also Fig. 79.) You will readily see that such a network of railways has had a great deal to do with the rapid development of stock-rearing and agriculture. One line crosses the Andes by the Uspallata Pass. Find the town of *Mendoza* which is on the railway at the foot of the eastern Andes. You will remember that this belt receives a small rainfall, yet Mendoza is the centre of an important vine, peach and fruit growing industry. Of course, this is only possible because of careful irrigation, the water being supplied by streams from the Andes. Considerable irrigated areas are devoted to the planting of poplars, for which there is a great demand in the treeless pampas. Another of the railways connects Buenos Aires with *Cordoba*, a pampas stock-rearing centre, and proceeds to *Tucuman* farther north. In this district, as at Mendoza, irrigation is practised, and the temperature allows the growth of sugar, rice and tobacco.

THE LOW PATAGONIAN PLATEAU

This is a shingle and sand desert. Sheep and cattle-rearing,

especially the former, are the chief occupations. The best lands are near the watershed, for the rest of the region suffers from a lack of rainfall, and sheep, guanacos, and rheas can only find sustenance on the scattered grass patches. The skin of the guanaco is used by the natives in the making of tent-coverings and clothing.

The chief port of this region is *Bahia Blanca*. It is the naval station of Argentina, and also exports the produce of the best stock-rearing lands of Patagonia.

THE BRAZILIAN HIGHLANDS

This region is forested along the Atlantic coast, but the plateau is a savannah land. Most of the rivers are interrupted by waterfalls. The most important is the São Francisco, which is 1,800 miles in length. It is interrupted by rapids, above which it is navigable for over 1,000 miles (Fig. 77). Mining for precious stones, especially diamonds, is carried on in the upper valley.

Examine Fig. 76, which gives the distribution of the most important products of this region. Brazil is the chief coffee-producing country in the world, its total output forming 80 per cent. of the world's supply. The chief coffee plantations are in the neighbourhood of *São Paulo*, which is connected by rail with *Santos*, its port. (See Fig. 80.) This area has very rich volcanic soils. The coffee plant, which was introduced into Brazil in the eighteenth century, if left to itself, grows to a height of about 25 feet; but in the plantations it is not allowed to grow so high, or considerable difficulty would be experienced in gathering the berries. A warm, moist climate, free from frosts, is required. Cotton, tobacco and sugar are also grown on the narrow coast-plains and on the lower mountain slopes. These are exported from Bahia and Pernambuco. Cacao is the chief product of the forested lands on the north coast.

The campos, or savannahs, of the highlands are little developed, and are only slightly peopled, although cattle-rearing is increasing in importance. Extensive areas are composed of granite and sandstone, the soil from which is often very infertile, whilst in many districts the severe drought of the dry season makes settlement very difficult. This and the former lack of large domestic animals account for the small

native population and the present backward condition of much of this region. The most important cattle-rearing district is in the south-west, adjoining Uruguay. *Rio de Janeiro*, from which railways climb the difficult slopes of the escarpment and reach the coffee-producing, cattle-rearing and mining districts, is the largest city and port in Brazil (Figs. 80 and 81).

THE GUIANA HIGHLANDS

We have already learned that this region may be compared with the Brazilian highlands, from which it is separated by the broad Amazon valley. The Guiana highlands are very difficult of access, partly on account of their rugged nature, and partly owing to the fact that routes following the rivers—the natural means of entry—are impeded by waterfalls in the upper and middle courses, and by dense forests in the lower valleys. The higher plateaus are suitable for cattle-rearing, but at present are little developed, in fact, the whole region, except where gold has been found and mined, is little known.

The very flat Coastal Plains are hot wet forests, in the clearings of which rice, sugar and cacao are produced. Labourers have been introduced from Africa and India in such numbers that negroes and coolies far outnumber the white population. The largest town is *Georgetown*, which is near the mouth of the chief river, the Essequibo.

THE NORTH ANDEAN OR COLOMBIAN REGION

The Western Cordillera and their Pacific slopes may be divided into the following units or natural regions: the North Andean or Colombian Region, the High Plateaus of Peru and Bolivia, the West Coast Desert, the Mediterranean Land of Central Chile, Southern Chile.

The northern Cordillera consists of three well-marked mountain systems, between which are deep river-valleys occupied by the rivers Magdalena, Cauca and Atrato. (See Fig. 74.) These three systems unite, forming a great knot at Pasto, south of which is the high plateau of Ecuador, buttressed on the east and west by higher mountain chains. You will see that although their lower parts are often swampy, the river valleys would be the way by which, in the

early days of Spanish occupation, the minerals from the mines on the plateau were brought to the Spanish treasure-ships waiting along the north coast.

The climate of this region very much resembles that of Central America, and the same well-marked belts are met with. *The Hot Lands*

(Tierra Caliente) are the coastal lands and the lower river valleys. These receive heavy rainfall, and are tropical forests. Cacao, sugar, tobacco and rice are cultivated, whilst coffee is the chief product of the lower slopes of the mountains. *The Temperate Lands* (Tierra Templada) and *Cool Lands* (Tierra Fria) are higher, and are found in the fertile uplands and higher valleys. Their chief products are the cereals of the temperate zone such as maize and wheat, whilst on the higher plateaus stock-raising is the chief occupation. The limit of cultivated plants is

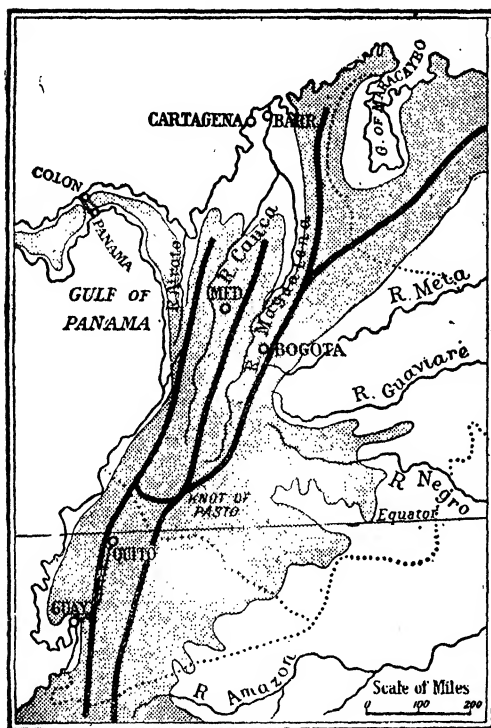


FIG. 74.—Map of the Colombian region. The thick lines show the direction of the main Andean ridges. The high ground is shaded.

about two miles above sea-level, and beyond that the country is generally treeless, bleak and almost uninhabited. These higher areas are known as *Paramos*.

You will remember that on the eastern slopes of the Andes are the forests known as the *Montana*. In the clearings, cacao, cinchona, etc., are cultivated, and when this area is made more accessible by improved means of communication, it will support a much larger population than it does at present.

The Colombian region has long been noted for its minerals, especially gold and silver. The chief gold-mines are in the neighbourhood of Medellín which lies on the range between the Magdalena and Cauca valleys. Emeralds and platinum are also very important and to-day constitute the greater part of Colombia's national income from its mineral resources. It is not impossible that Colombia may succeed to the position of the world's chief producer of platinum now held by Russia, for there are rich deposits of that valuable mineral.

The most important inland towns are *Bogotá*, capital of Colombia, the largest town in the Colombian region, and *Quito*, the capital of Ecuador. These towns are near to the equator, Quito being almost on it, but owing to their elevation—8,700 feet in the case of the former, and 9,500 in the case of the latter town—they enjoy temperate climates. Quito is reached by a railway from *Guayaquil*, the port of Ecuador. The chief ports on the Caribbean Sea are *Cartagena*, an old Spanish port; *Barranquilla*, which has largely replaced Cartagena as an outlet for the main artery of trade—the river Magdalena; *Maracaibo*, on a large gulf of the same name, and *La Guaira*, the port of Caracas, the Venezuelan capital.

The Panama Canal has been the means of giving an impetus to the development of this region. The ports of north-west South America have now much better communication with the east coast of North America and Western Europe than formerly, and the products of this region are such as are interchangeable with those of the regions mentioned. That is, the Colombian countries require manufactured articles in exchange for the minerals, coffee, sugar, cacao, etc., which are needed by the eastern states of North America and the countries of Western Europe.

THE HIGH PLATEAUS OF PERU AND BOLIVIA

Turn to the physical map in your atlas and to Fig. 75. These plateaus are the chief feature of the Andes from the point where the Maranos, the head stream of the Amazon, turns eastward to the place where the system becomes one great range. In the northern portion, in Peru, three distinct chains can be traced, whilst in the south there is the great

plateau of Bolivia, the largest of all the Andean plateaus. Its elevation above sea level is about two and a half miles, whilst several of the peaks in the marginal ranges reach the great height of four miles above sea level. This plateau is known as the *puña* and may be compared with Tibet. Find Lake

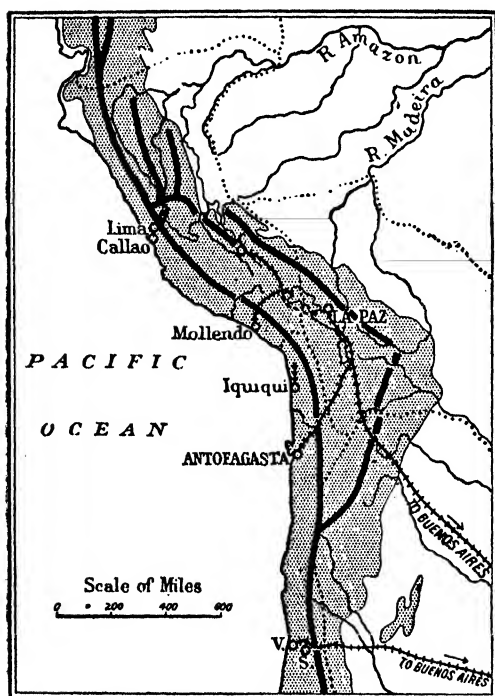


FIG. 75.—Map of the Peruvian and Bolivian Plateaus. The thick lines show the direction of the main Andean ranges. The high ground is shaded.

Titicaca. You will notice that it is connected by a river to another large lake farther south. Have these lakes any outlet to the sea? Like the Great Salt Lake, they are centres of inland drainage. Lake Titicaca, which is of great depth, is about the size of Lake Erie, and is 12,500 feet above sea level. Overlooking it on its eastern border are many of the highest peaks in the Andes.

On these plateaus the rainfall is very small, except on the eastern slopes, where there is the "montana," to which reference has already been made. The temperature is every-

where lowered by elevation. Many of the high plateaus are grass-lands, so that pastoral pursuits form one of the chief occupations; other areas are suitable for the production of the cereals of temperate latitudes, a considerable amount of maize being grown, although not so much as in the old Inca days. Besides cattle and sheep, llamas, alpacas and vicunas find sustenance, their flesh giving food, and their wool

material for clothing and for exportation. The llama and the alpaca are allied to the camel, but are much smaller and have no hump. The former is about four and a half feet high and the latter about a foot smaller. The male llamas are trained to carry burdens up to 100 lb. in weight. Being very sure-footed they are of great importance in an area where the ordinary means of communication are so difficult. Llamas and alpacas are pastured in very large flocks. Vicunas are of the same genus, but are generally met with in a wild state on the higher plateaus.

The mineral wealth of these plateaus is enormous. The most famous silver-mines in history are those of Potosi, in Bolivia. It has been estimated that silver to the value of over £600,000,000 has been extracted from these mines since their discovery in 1545. Silver is also mined at Cerro de Pasco, in Peru. Besides silver, there are rich deposits of copper and tin, especially the latter.

The chief towns are *Cerro de Pasco*, noted for its silver-mines, and *Cuzco*, which is situated in a fertile intermont valley, and possesses splendid ruins of the old Inca capital. The former is connected by rail to the port of Callao, and the latter to Mollendo (Fig. 77). *La Paz*, the capital of Bolivia, is situated south-east of Lake Titicaca, and is connected by rail with Antofagasta. A steamer service on Lake Titicaca also connects La Paz with the railway from Mollendo, which reaches the western end of the lake. These two lines carry the bulk of Bolivia's trade. Fig. 77 shows a connection which has recently been made with the railways of Argentina.

THE WEST COAST DESERT OF NORTHERN CHILE AND PERU

This desert, the Chile portion of which is known as the Atacama, occupies the Pacific slope of the Peruvian and Bolivian plateaus, and owing to the nearness of the latter to the west coast, it is very narrow. We have learned that it owes its desert conditions to its position on the west of the continent in trade-wind latitudes. The only areas where vegetation is found are the narrow ribbon-like bands following the rivers which cross this region on their journey from the Andes to the sea. It is in these oases, that, by careful irrigation, cotton and sugar can be grown in the northern

portion of the desert. These irrigated tracts may be compared with the cultivated lands on the Lower Nile in Egypt, although, of course, the latter are much more extensive.

Although in many ways a great drawback, the rainless character of this desert has preserved for it its most important commercial product. The chief fertilizing constituents have not been washed out of the soil, and vast quantities of nitrates have thus been preserved. They are much sought after, not only for invigorating poor or exhausted soils, but for the manufacture of chemicals. The chief purchasers are Germany, Great Britain and the United States. The ships engaged in the trade bring to Chile great quantities of coal in addition to other goods. *Iquique* and *Antofagasta* are the chief ports trading in nitrates, and the most important deposits are found some distance inland at an elevation ranging from 3,000 feet upwards. Other minerals are mined, especially copper, of which Chile is the world's second largest producer, but nitrates are of prime importance.

Of the towns not already mentioned, the chief is *Lima*, the Peruvian capital. This town was once the Spanish capital, and has a magnificent cathedral. The houses are built of adobe, or mud-brick, which is also used for the boundaries between the fields. Its port is *Callao*, which has already been mentioned as the port for the Cerro de Pasco silver-mines. The three towns are connected by railway. Lima and Callao are in the valley of the river Rimac, one of the short streams crossing the desert.

THE MEDITERRANEAN REGION OF CENTRAL CHILE

This region of winter rainfall lies south of the Atacama desert. Along the Pacific coast there is a coastal range which farther south, owing to subsidences, is represented by a string of islands. To the east there is the great single chain of the Andes, whilst between them we find the long narrow valley of Chile.

This valley is now more thickly peopled than any other part of the west coast of South America, and it is one of the few parts of the continent suitable for the settlement of white

people. All the fruits usually found in Mediterranean regions can be grown, but the most important is the vine. Considerable quantities of wheat and barley are produced and form important exports, although not so much is exported as formerly, owing to the increasing home demand.

The chief port is *Valparaiso*, the largest American Pacific port after San Francisco, and like that city, it is subject to earthquakes, both having been partially destroyed so recently as 1906. *Santiago*, the capital, is in the valley. *Concepcion* is the southern port for this area. In its vicinity coal is found, and cattle-rearing is also carried on.

SOUTHERN CHILE

We have compared this region with British Columbia. Each shows extensive signs of glaciation and sinking. In each, the coast range is represented by islands, and the narrow plains behind the coast ranges have been drowned; the coast of each is indented and pierced by long arms of the sea which resemble the fiords of Norway, and the sea-lochs of the west of Scotland and Ireland. These have been formed by the land sinking and drowning the river valleys, which have been broadened and deepened by the action of glaciers. Magellan Strait is a fiord piercing right through the mountain range, thus separating the island of Tierra del Fuego from the mainland. Notice, too, that the physical map in your atlas shows that the Andes decrease in height as they go farther south. It will also show that the Falkland Isles are on a broad continental shelf. These things are further evidences of sinking. Like British Columbia, Southern Chile is a region of temperate forests, but lumbering has not attained the importance it has reached in British Columbia. Cattle and sheep rearing are carried on in the north, and fishing along the coast. Why should you expect the latter industry? Very many of the islands off the coast are uninhabited. The largest and most important is *Chiloe*, which has a cold, wet climate, and is inhabited by Indians.

South of the long, winding Strait of Magellan, is the large island of Tierra del Fuego, which is about two-thirds the size of Scotland. Its physical features are a continuation of those of the mainland. Owing to its cold, wet climate, it has very few

inhabitants, and the chief occupation is sheep rearing. Notice the port of *Punta Arenas*, on the mainland, north of Magellan Straits. This is the most southerly permanently inhabited town in the world. How much nearer the South Pole is it than Hobart or Cape Town? It is a coaling and repairing station, and the centre of a sheep-rearing district.

The Falkland Islands lie about 250 miles north-east of Tierra del Fuego, and belong to Britain. Find them on your map. The climate is cold and wet, and strong winds blow nearly all the year. It is mainly owing to the force of these winds that there are no trees on the islands. All kinds of agriculture, except the growing of a few vegetables, are impossible, and the chief occupation is sheep rearing. Originally the sheep were imported from Great Britain, and it is remarkable how well they thrive in a land having such a severe climate. The chief harbour is at *Port Stanley*, on the more easterly of the two large islands. Its chief importance is as a port of call for ships in need of water or food, or for the repairing of damage caused by the stormy winds of these seas. The population of the whole group is only 2,400.

EXERCISES

1. Trace an outline map of Europe, and upon it draw a map of the Amazon basin to the same scale. How does the area of the latter compare with that of Europe?
2. Draw a map of the Amazon basin.
3. In what parts of South America are the following produced: coffee, cotton, wool, rubber, wine, wheat? Account for their distribution.
4. Compare the human life on the high plateaus of the Andes with that in the Amazon basin.
5. What are the chief occupations in South America? Where is each carried on? As far as possible compare the conditions with those which obtain in North America.
6. Take any three regions in South America, and name those regions in North America which may be compared with them. Point out the comparisons, and also any contrasts you may observe.

CHAPTER XXX

THE COUNTRIES OF SOUTH AMERICA

So far we have considered the physical features, climate, vegetation and natural regions of South America. In going over these we have covered the outlines of the geography of the continent, but before leaving it, we will take each of the countries in turn, and see how its boundaries agree with the natural regions. In this way we shall rapidly revise what we have learned. We will begin with Colombia, taking next the countries to the north of the Amazon, afterwards the remainder of those connected with the Andean Cordillera, and lastly the countries of the Plate and Amazon basins and the Brazilian highlands. Fig. 72 will help us, as it shows the natural regions and the political divisions. Fig. 76 should also be consulted. The area and population of each country are stated. In connection with the former, for purposes of comparison, it is well to remember that the area of the British Isles is 121,200 square miles, and that the population is between 49 and 50 millions. It is also worth noting, that although our maps show the boundaries between the various countries, very many of these have not been definitely fixed, and boundary quarrels are frequent.

COLOMBIA

Area, 440,846 square miles.

Population in 1934, 8,368,000 (only about 20 per cent. are pure "whites").

Colombia consists of—

- (i) An Andean area.
- (ii) A Llanos area.
- (iii) An Amazon and hot tropical forest area.

The larger portion of the people live in the first region, especially in the valleys of the Cauca and the Magdalena, and on the high plateau.

The capital is *Bogotá*, which is situated on a very high but

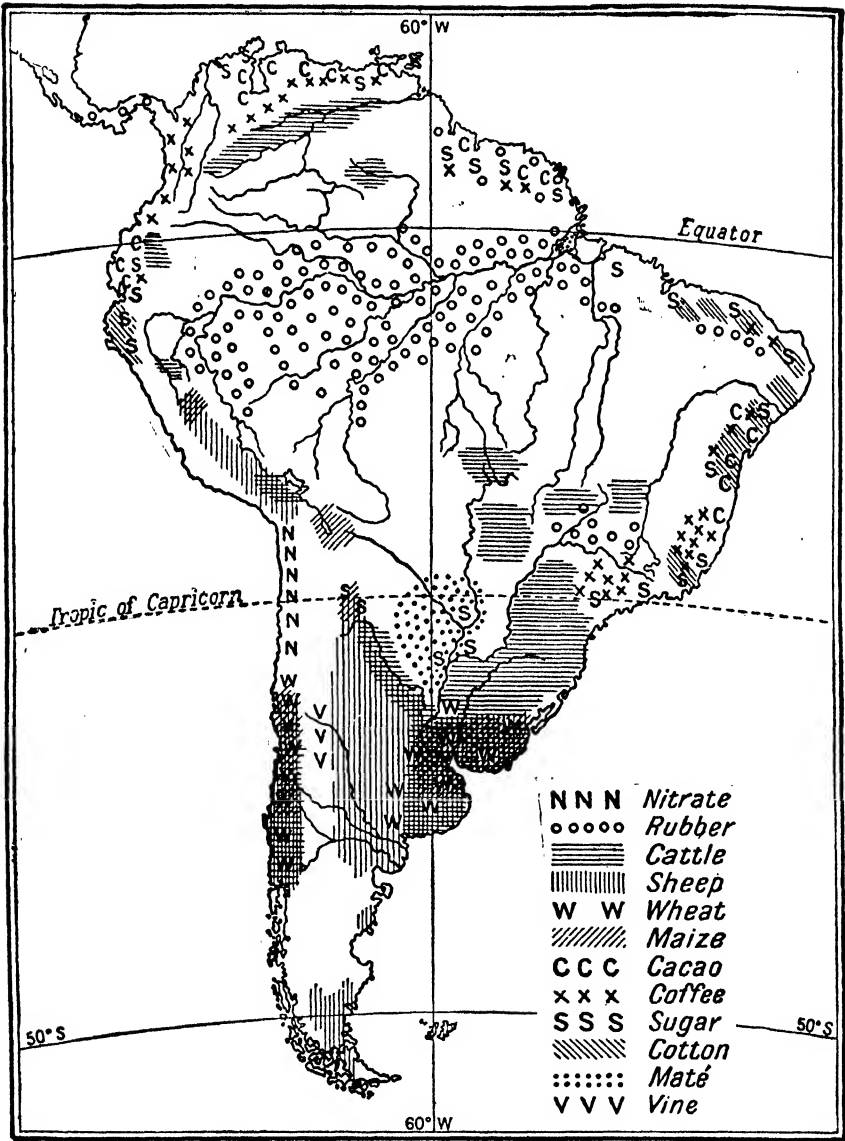


FIG. 76.—The chief products of South America.

fertile plateau. What will this country export? Notice its natural units and its position, and remember the three zones of climate in the Andean section. There should be no difficulty in writing out a list which would include coffee, cacao, rubber, hides and skins. Add to these the minerals, especially gold, silver, emeralds and platinum (see p. 209). The chief ports are Barranquilla and Cartagena. Eighty per cent. of the trade is carried on through Caribbean ports. Buena-ventura is a growing port on the Pacific.

VENEZUELA

Area, 398,594 square miles.

Population in 1932, 3,262,000 (mainly of mixed descent).

The name of this republic requires some explanation. It was given by Amerigo Vespucci during his second voyage (1499-1500). He was then sailing on behalf of Spain, and when the ships sailed into the great Gulf of Maracaibo, he found that the Indians built their villages on piles driven into the sea. Amerigo, who was an Italian, compared them with Venice, and gave the name Venezuela, or Little Venice.

Of what natural regions does this country consist? Examine Fig. 72 and it will be seen that it contains—

- (i) The northern portion of the most eastern of the three ranges which make the northern Andes. Notice that this range hinders communication between the coast and the interior.
- (ii) A Llanos area.
- (iii) A Guiana highlands area.
- (iv) An Amazon forest area.

Most of the people live in the first area, the uplands having a healthier climate than the other regions. This part of the country produces sugar, coffee and cacao. The llanos area produces cattle and hides, whilst rubber is the chief article of export from the coastal plains which skirt the Guiana highlands and from the Amazon lowlands on the south. There are few pure whites in the country. The capital and largest town is *Caracas*, whose port is La Guaira.

THE GUIANAS

	Area in sq. mls.	Population.
<i>British Guiana</i> . . .	90,000	318,000
<i>Dutch Guiana (or Surinam)</i> . .	54,000	160,000
<i>French Guiana</i> . . .	34,700	22,000

These are the only parts of the mainland of the continent ruled by European countries. Look again at Fig. 72, and see of what natural regions they consist. They are—

- (i) A Guiana highlands area.
- (ii) The hot wet forests of the Coastal Plains.

Therefore the chief products are sugar, coffee, cacao and bananas. Gold is mined in the mountains, which you will remember are little known.

Georgetown, in the district of Demerara which gives its name to a kind of cane sugar, is the capital of British Guiana.

The capital of Dutch Guiana, or Surinam, is *Paramaribo*, and of the French area, *Cayenne*. The last-named town stands on an island of the same name. This island is used as a French penal settlement.

ECUADOR

Area, 276,000 square miles. (Frontiers not definitely settled.)

Population, officially estimated in 1934 at 2,647,000, is uncertain, but most people are found in the Andean plateau.

Examine Fig. 72. This country, which gets its name from the word "equator," has within its frontiers—

- (i) An Andean area.
- (ii) An equatorial forest area (including Montana).

Which of these areas would you expect to be less developed? Why? *Guayaquil* exports cacao and coffee, and is connected with *Quito*, the capital, by a railway which has to climb nearly two miles in order to reach that town. The Galapagos Islands, which are about 750 miles due west of Ecuador, are owned by that country. They have a population of about 2,000, and are noted for their giant tortoises and turtles.

PERU

Area, nearly 482,133 square miles.

Population, estimated in 1927 at 6,147,000 (more than half pure Indians).

Of what regions does this country consist?

Fig. 71 shows that they are—

- (i) A narrow west coast desert area.
- (ii) The peruvian plateau.
- (iii) An Amazonian and Montana forest area.

Flocks of sheep, alpacas, llamas and vicunas find support on the grass-lands of the plateau, and the mountains are very rich in minerals. Remembering this, and keeping in mind the natural regions stated above, we shall expect the chief productions to include: sugar, coffee and cotton (from the irrigated valleys of rivers crossing the desert); wool and metals (from the plateau); rubber, cacao and cinchona (from the Amazon forests and Montana).

Of these regions the Amazon forest area is most difficult of access. The best way of reaching Iquitos is by way of the Amazon. It is proposed to continue the railway from Callao, which reaches Cerro de Pasco via Lima and Oroya (see p. 211), to Iquitos, using one of the headwaters of the Amazon as a means of descent from the plateau.

Lima is the capital, and *Callao* the chief port.

Cuzco is the old Inca capital.

BOLIVIA

Area, 514,155 square miles.

Population, estimated at 3.1 millions (of whom 80 per cent. live at an altitude of over 10,000 feet. Fifty per cent. are Indians.)

The natural regions of Bolivia are—

- (i) The plateau.
- (ii) The Amazon and Montana area.
- (iii) A savannah area.

Bolivia and Paraguay are the only countries in South America which have no coast-line. Since the various republics have been formed, there have been many wars owing to boundary disputes, and after one of these in 1879–81 Bolivia lost her Atacama desert strip of coast-line, although she still has certain rights of access to the sea, across the coastal lands of Chile and Peru. The majority of the inhabitants live in the first region, for the others are little developed. The chief exports include—rubber, cinchona and minerals, especially tin (65 per cent. of total exports) and silver. As Bolivia has no coast-line, its exports have to be sent to the ports through other countries. The railway from

Antofagasta to La Paz is now connected with the railways of Argentina, so that much Bolivian trade finds an outlet via

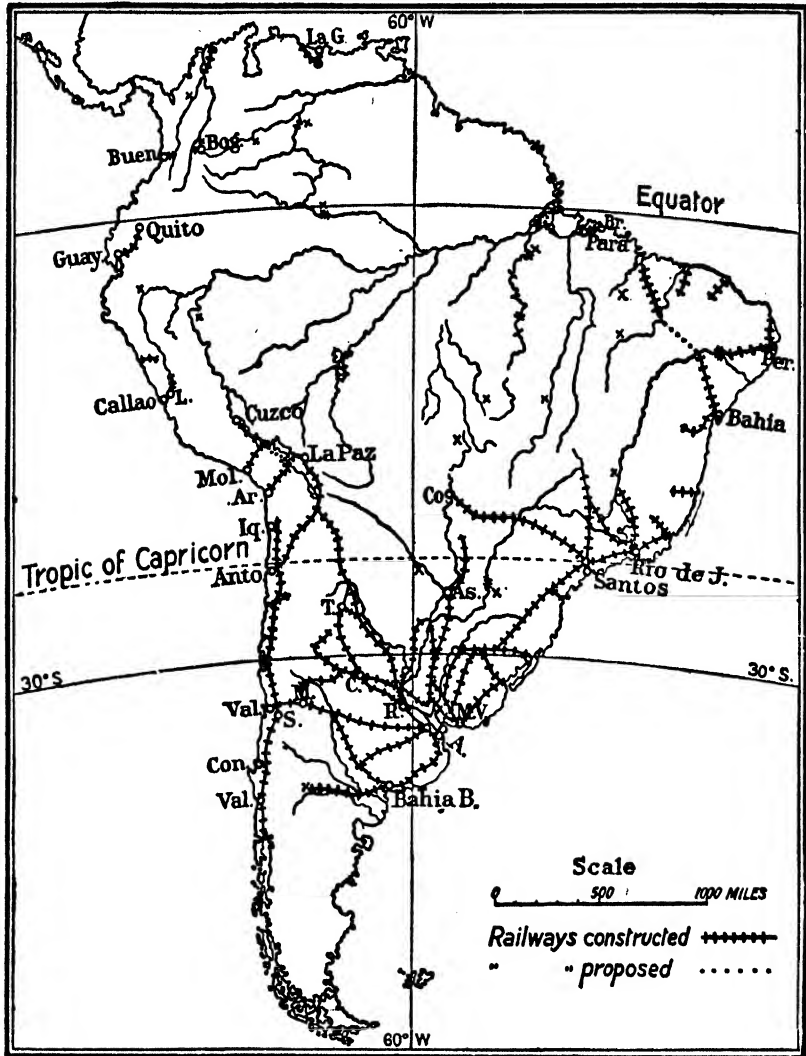


FIG. 77.—The chief means of communication.

Buenos Aires (Fig. 77). The capital is *La Paz*; and *Potosí* is the chief mining centre. Bolivia produces nearly one

quarter of the total tin output of the world, and ranks next to the Malay Peninsula in the production of that metal.

The mining industry is kept in a backward state on account of the great difficulty in obtaining suitable labour. Owing to the great elevation it is very difficult to get workmen, for it is not easy to work at such altitudes. The natives are not naturally inclined towards mining.

CHILE

Area, 285,133 square miles.

Population in 1934, 4,446,000 (mainly of European origin, chiefly Spanish, and mixed Spanish and Indian descent).

The map of South America shows that Chile stretches through about 36 degrees of latitude (18° S. to 54° S.). This is about 2,500 miles, which is a very great distance indeed, being almost as far as from Gibraltar to the north of Norway. It will also be noticed that the country is extremely narrow. This is, of course, because it occupies the western slopes of the Andes and their margins, and the Andes are close to the coast. It would appear that such a peculiarly shaped country as Chile would be very difficult to govern. But look at Fig. 78, and notice of what natural regions it is composed. They are—

- (i) An Atacama desert area in the north.
- (ii) A Mediterranean region in the centre. This region is a transitional one between the desert and the—
- (iii) Cool Temperate forest region in the south.

We have seen that the central area is the most densely peopled part of the country (Fig. 82), and this is because it has the best climate and is productive. Since the country is so very long, it is fortunate for the purposes of government that the centre has the largest population. No part of the country is far removed from the sea, so that communication by sea is not difficult. It is interesting to note that the majority of the people of Chile are whites, and this is because it is one of the places in South America where the climate is suitable for white people to live in.

The capital is *Santiago*, the third largest town in South America, and the chief ports are *Iquique* and *Valparaíso*.

The former is the chief port for nitrates, which form not only Chile's most important export but, through the export taxes, provide the chief source of government revenue. During the Great War the exports fell tremendously and many of the poorer mines were closed down. The prospects

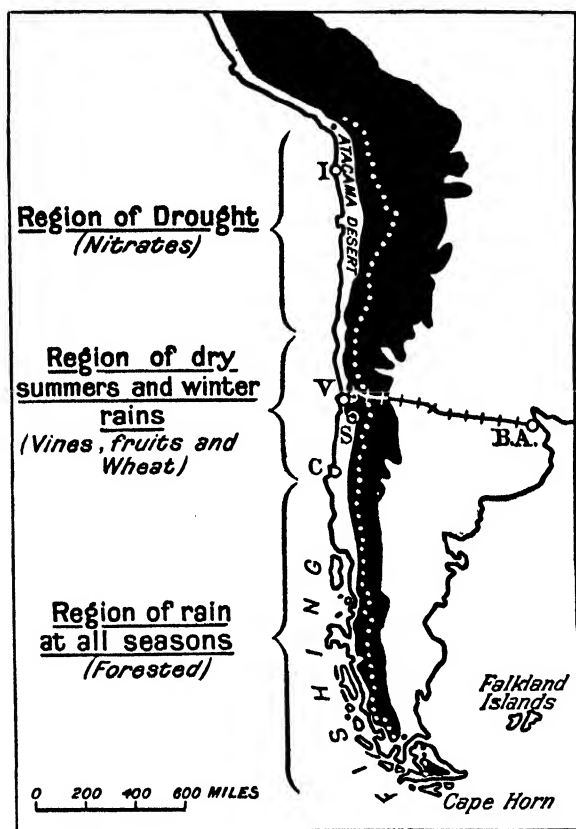


FIG. 78.—Sketch map of the natural regions of Chile.

of an early return to normal conditions are favourable, for the United States is increasing her purchases and Germany is reappearing as a consumer. *Valparaíso* is the terminus of the transcontinental line from Buenos Aires, and is the port for the agricultural area of Central Chile. The forests in the south are as yet little developed.

ARGENTINE REPUBLIC

Area, 1,080,000 square miles.

Population in 1935, 12,228,000 (75 per cent. are Argentine-born and of European descent).

The name Argentina means "silver land." The name La Plata, too, reminds us of the great lure which brought Spaniards to its waters. The silver was not mined in Argentina, but its plains and rivers were routes by means of which the mines of Peru could be reached. The population in this country is centred mainly on the plains of the Plate River. There is a very large number of Italians and Spaniards, for the climate is suitable for southern Europeans. Examine Fig. 72, which shows that Argentina contains the following natural regions—

- (i) The grass-lands of the lower Plate basin.
- (ii) The eastern Andes and drier western plains.
- (iii) The Patagonian desert.
- (iv) The forest and savannah region of Gran Chaco.

Remembering what has been learned about these regions, you will infer that Argentina's chief wealth lies in agricultural and livestock industries, and that the chief products will be—wheat, maize, meat, wool, skins, etc. (grass-lands), with the addition of fruits and wines (Mendoza area), and sugar and tobacco (Tucuman area).

The capital and chief port, *Buenos Aires* ("good air"), has 2,250,000 inhabitants and is the largest city in the southern hemisphere. The city is in an eminent degree the

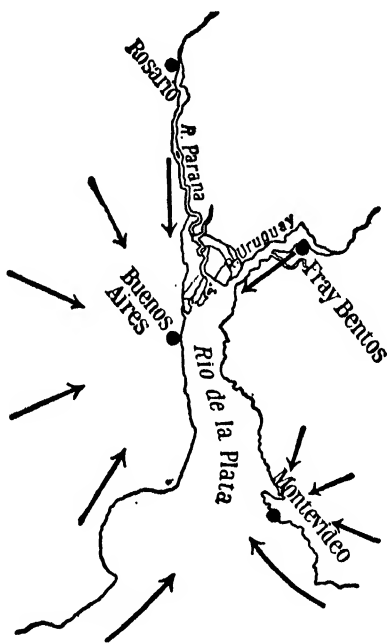


FIG. 79.—Sketch map of the Rio de la Plata and its great ports.

heart of the republic. The estuary of the Plate is shallow, owing to the deposition of sediment, so that Buenos Aires has a very poor natural harbour. At great cost an artificial harbour has been made, and the enormous trade of the port has fully justified the outlay. From Buenos Aires, railways, largely British owned, radiate to all parts of the country (see p. 205), but there is a serious deficiency of good roads, which greatly handicaps trade. Why is it that railway construction is comparatively easy in this part of South America?

Rosaria and *Santa Fé* are important river ports engaged in the exportation of wheat, wool and cattle. *Cordoba* is the chief centre of the great stock-rearing area west of the Parana. *Mendoza* and *Tucuman* are centres of agricultural areas dependent upon irrigation.

PARAGUAY

Area, 75,673 square miles.

Population in 1934 (estimated), 902,000 (mostly Mestizos and Indians).

A glance at the map of South America will show the inland position of this country. What river forms its eastern frontier? Its western? What river runs through the centre? Paraguay is largely forested, although its eastern portion, which contains 95 per cent. of the population, contains extensive grass-lands. In the west is the Gran Chaco. It will be recalled that one of its chief products is yerba maté or Paraguay tea, the use of which the Spaniards learned from the Indians. The backward state of the country is largely due to devastating wars, but also to its position far from the coast and the chief lines of communication.

The leading occupation is cattle rearing, and in recent years sheep rearing and cotton growing have met with some success.

The chief exports are: meat, hides, tallow (from the grass-lands), and maté and oranges. Oranges are cultivated or grow wild in all parts of the country.

The capital, *Asuncion*, stands at the junction of the Paraguay and one of its chief tributaries, and is reached in about fifty hours by rail from Buenos Aires. The journey by river takes five days.

URUGUAY

Area, 72,150 square miles.

Population in 1935, 2,020,000 (largely of Spanish descent ; many Spanish and Italian immigrants).

The physical map will show that the country has a general slope towards the south-west. Examine Fig. 71 and you will see that it consists of grass-lands. The chief occupations are cattle and sheep rearing and some agriculture, so that you will expect such exports as wool, hides, meat and extracts. The English firm of Liebig has very large extract works at Fray Bentos and Paysandu on the river Uruguay. The basis of practically the whole trade of the country is the meat trade, for in the average season only sufficient grain is pro-

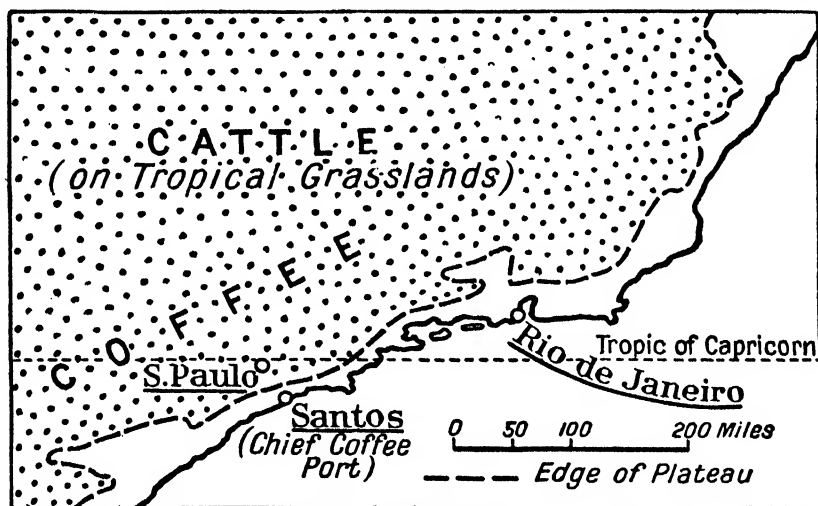


FIG. 80.—Sketch of part of eastern Brazil.

duced for its own needs. *Montevideo* is the largest city and the chief port, owing its importance to its splendid situation on the Plate estuary. It has about 660,000 inhabitants and handles 95 per cent. of the total exports and imports. That is why Uruguay has been called "the one-town republic."

BRAZIL

Area, 3,275,510 square miles.

Population in 1934, 45,333,000 (estimated).

This large country is very little less in area than the whole

of Europe. It has half of the people of South America. It is also remarkable that its boundaries march with those of every other country in the continent except Chile and Ecuador. Of what natural regions does it consist? They are—



FIG. 81.—Map showing the position of Rio de Janeiro.
Compare this with Fig. 80.

- (i) Hot wet forests of the Amazon basin and the east coast plains.
- (ii) The Brazilian highlands.
- (iii) Temperate grass-lands in the south.

We are quite familiar with the chief products of these areas. They are: rubber, cacao, coffee, cotton, sugar, meat, hides, etc.

The capital and chief port, *Rio de Janeiro*, a fine city of 1,700,000 inhabitants, has a splendid harbour, and excellent railway communications with its hinterland (Figs. 80 and 81). *Santos* is the port for *São Paulo*, the centre of a region producing more than half of the world's coffee and the only large town in the country which is not a port (Fig. 79).

Bahia exports cacao, sugar and cotton; and *Manaos* at the confluence of the Negro and the Amazon, and *Para* at the mouth of the Amazon, are the great collecting centres for the rubber of the Amazon basin.

EXERCISES

1. Give the position and importance of each of the following cities, illustrating your answers by sketch maps: Buenos Aires; Rio de Janeiro; Valparaiso; Manaos; Para; Quito. How has the geographical position of each city influenced its growth?
2. Into what natural regions may Brazil be divided? Compare their relative importance as regards trade and facilities of settlement.
3. Compare the present development of the prairies of North America with that of the pampas lands of South America.
4. Write a descriptive account of a railway journey from Buenos Aires to Santiago.
5. Into what natural regions may Chile be divided? State clearly the reasons for their differences. Which of these areas is best adapted for settlement by Europeans.

CHAPTER XXXI

COMMUNICATIONS AND TRANSPORT: THE DISTRIBUTION OF POPULATION

Communications and Transport.—These have been mentioned in connection with each region. We will now consider them as regards the continent as a whole. Examine Fig. 77. The chief facts to notice are—

1. The barrier which the Andes constitute in communication between the east and west coasts. Where is the best transcontinental line? Where is there a longer alternative?

2. The number of railways which climb from the west coast to the plateau.

3. How far these plateau railways are at present linked together. It would be of considerable advantage to link up the whole system.

4. The scarcity of railways in the Amazon forests. A line has been built round the cataracts and rapids of the Madeira and Mamoré rivers. (See Fig. 77.)

5. The network of railways in the Plate lowlands. Why is this?

6. The distances for which most of the great rivers are navigable. The Amazon alone has 50,000 miles of navigable waterways.

7. Away from the railways and rivers, the chief means of transport is by llamas and mules, which are of greatest use on the difficult Andean roadways.

The Distribution of the Population.—The total population of South America was 38 millions in 1905. By 1930 it had risen to 80 millions, the increases having chiefly taken place in Argentina and Brazil. Even now, however, South America remains sparsely populated, and over vast areas the population remains to-day practically what it probably was when the continent was first discovered.

Examine Fig. 82 which shows the distribution of the population. As we have already considered all the causes which influence this distribution, you should be in a position to answer the following questions about this map:—

1. Why is it that although about four-fifths of the continent is within the tropics, the most populated areas are outside the tropics?

2. What influence have (*a*) mountainous areas, (*b*) deserts, (*c*) forests, on the distribution of the population?

3. Which regions of South America are the best suited for the settlement of Europeans? Why are these immigrants chiefly from the countries of southern Europe?

4. The Savannah lands of Africa have always supported large native populations. Why is this not true of South America?

5. Account for the distribution of the people in Brazil and in Chile.

6. Compare the lowlands of the Plate River with the Peruvian and Bolivian plateaus as regards their advantages for supporting a dense population.

CONCLUSION

You must have come to the conclusion that South America is still in the infancy of its development. The population map (Fig. 82) shows that the bulk of the people are near the coasts, and that there has been little penetration into the interior except in the case of the basin of the rivers drained into the Plate River. This basin has been enormously developed during recent years, but there are still great possibilities before it. The Mediterranean area of Chile also offers facilities for a greater increase of the population. Except for silver and gold, the mineral wealth of South America has been very little exploited. Better means of communication, and the linking up of the various railways, are much needed. The transcontinental railway from Buenos Aires to Valparaiso, and the Panama Canal, are bound to have important influences upon South American trade. With regard to the latter the north-coast ports and those of the west coast north of Valparaiso should gain very considerably as time goes on, for

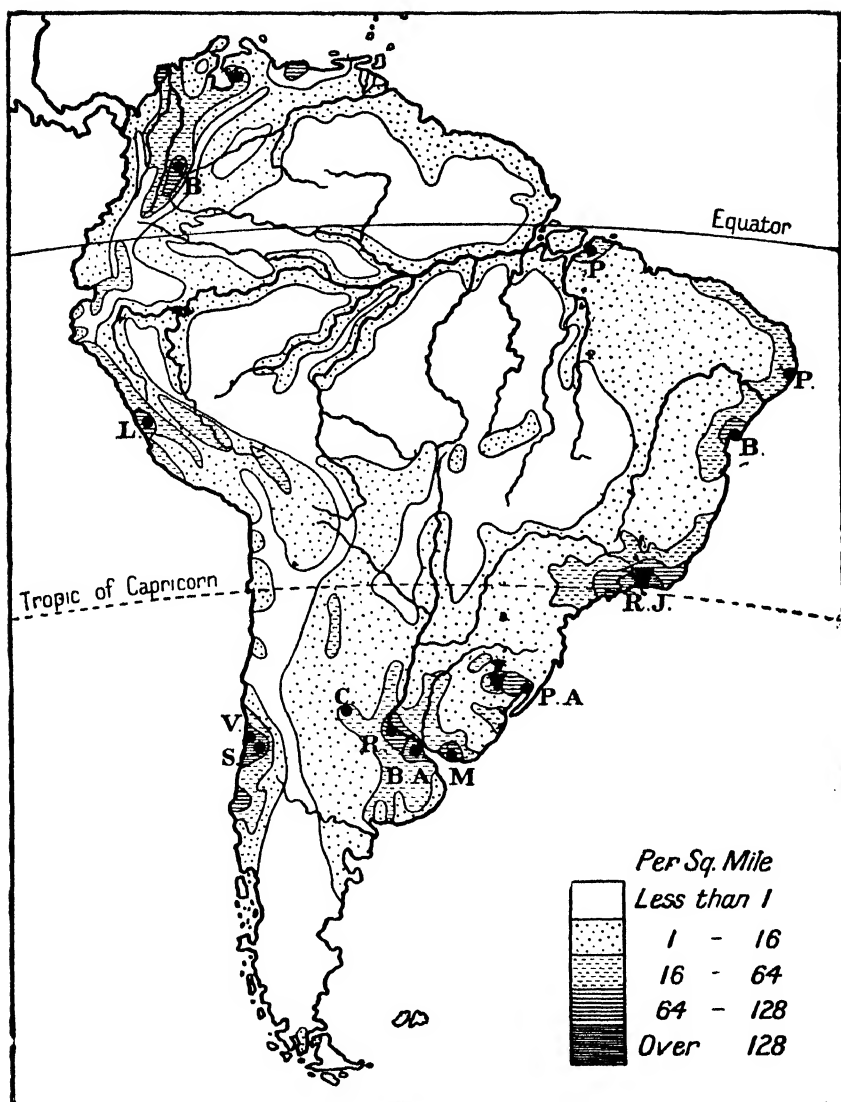


FIG. 82.—Sketch map showing distribution of the population.

they will be brought into closer touch with each other and with the ports of the east of North America and western Europe. Regarding the settlement of Europeans in South America, it would appear as though the continent will not attract large numbers of settlers from western Europe, but that there is very considerable opportunity for settlement by people from southern Europe. There are very large numbers of Italians and Spaniards in Argentina, Brazil and Chile (the A. B. C. of South America), although, as we should expect, the largest number of any one race entering Brazil are Portuguese. In recent years quite a large number of Germans, especially from southern Germany, have emigrated to the southern provinces of Brazil, which you will remember are the most temperate parts of the country. Here they are engaged in agricultural pursuits.

One of the great drawbacks to the advancement of South America is the backward state of the governments of most of the republics. Chile and Argentina are easily the most advanced countries, and what may be a lasting peace has been made between them (see p. 185). It would be a great step forward if the other republics would settle their boundary disputes in the same way. Colombia touches five other countries, and is in the unhappy position of having a very considerable extent of its frontiers unmarked. The general backwardness of the continent is one of the legacies of three hundred years of Spanish misrule and oppression. Other factors are the absence of a pure-bred vigorous white population, and the presence of so very many inhabitants of mixed descent. The latter are almost always difficult to rule, and have largely contributed to the numerous insurrections and revolutions for which Mexico, Central and South America continue to be notorious.

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